Appendix H
Selected Plant and Wildlife Surveys

Swamp Pink Survey

1.0 INTRODUCTION

The New Jersey Turnpike Authority proposes the construction of Route 92 in Somerset and Middlesex Counties, New Jersey (see figure D-1). The seven-mile, four-lane highway would serve as an east-west link between County Route 27 in eastern Franklin Township to Interchange 8A of the New Jersey Turnpike in western Monroe Township with potential interchanges at U.S. Route 1, Perrine Road, and Route 130. The majority of proposed Route 92 would be situated in South Brunswick Township with a shorter section located in the northern reaches of Plainsboro Township. The east and west termini of the proposed highway would extend into Monroe and Franklin Townships, respectively.

Three alignment alternatives are being considered, each with various interchange alternatives. For purposes of this report, the Project Impact Corridor is defined as the area 500 feet from the both sides of the centerline of each alignment alternative. In accordance with the National Environmental Protection Act (NEPA), Federal Highway Administration Procedures, and New Jersey Executive Order Number 215, an Environmental Impact Statement was prepared analyzing the impacts of all alternatives. In support of the Environmental Impact Statement, has been directed by the Federal Department of Interior, Division of Fish and Wildlife Service (FWS), a survey was performed to ascertain the presence or absence of swamp pink (*Helonias bullata*), which is considered a nationally threatened species and of which occurrences have been recorded within proximity to the Project Impact Corridor. A threatened species is defined by FWS as one likely to become endangered within at least a significant portion of its range.

The species, listed as imperiled by the New Jersey Department of Environmental Protection and Energy (DEPE) on the basis of its rarity (6-to-20 occurrences), is not contained in the New Jersey Natural Heritage Database as having been observed within the Project Impact Corridor. The FWS, on the other hand, does have record of its occurrence within six miles of the Project Impact Corridor and therefore requested a survey be implemented to verify the plant's status within the Project Impact Corridor.

Swamp pink, a member of the Lily family (Liliaceae), is a 1-to-2 foot high herb restricted to bogs and swamps from southern New York State to the Carolinas. FWS indicated that *H. Bullata* typically occurs in forested wetlands, although occurrence in scrub/shrub wetlands is known. It is an early blooming plant, and thus very conspicuous in mid-April to mid-May when it sets out its bright pink, lavender-pink or lilac flowers with bright blue stamens. The flowers, which have a hyacinth scent, form a dense, spike-like cluster at the top of a leafless, hollow stalk. At the base of the stalk is a rosette of lance-shaped, parallel-veined evergreen leaves. It has national and regional obligate wetland indicator status, meaning that it occurs in wetlands 99% of the time.

2.0 PROPOSED ROUTE 92 PROJECT IMPACT CORRIDOR

General

The Project Impact Corridor consists of mildly rolling topography that slopes in a southwestern direction toward the Millstone River. The area is dominated by agricultural and mature-to-early successional wooded land punctuated by scattered single-family homes, horticultural nurseries, farms, and commercial development. The intensity of non-agricultural development is typically greater at the eastern and western ends (particularly the former) of the Project Impact Corridor.

Forests

A large portion of the Project Impact Corridor consists of woodlands in various stages of secondary successional growth and with various blends of hydrophytic species. The older mature forested areas predominate and, depending on hydrology and soils, are typically dominated by a mix of red maple (*Acer rubrum*), sweet gum (*Liquidambar styraciflua*), American beech (*Fagus grandifolia*) and various species of Oak (*Quercus sp.*). Common shrub species include sweet pepperbush (*Clethra alnifolia*), arrowwood (*Viburnum dentatum*), highbush blueberry (*Vaccinium corymbosum*), spicebush (*Lindera benzoin*) dewberry (*Rubus flagellaris*) and sassafras (*Sassafras albidum*). The vine stratum is characterized by Japanese honeysuckle (*Lonicera japonica*), poison ivy (*Toxidendron radicans*), greenbrier (*Smilax rotundifolia*) while common non-woody species include spring beauty (*Claytonia virginica*), pine moss (*Lycopodium obscurum*), ground cedar (*Lycopodium complantatum*), sensitive fern (*Onoclea sensibilis*) and jewelweed (*Impatiens capensis*).

Red Maple/Sweet Gum is the most prevalent forest cover type and is found in low lying poorly drained wetland areas. Associated trees include pin oak (*Quercus palustris*), American elm (*Ulmus Americana*) and black gum (*Nyssa sylvatica*). These trees have shallow root systems due to saturated soil conditions. The shrub layer is composed of sweet pepperbush, sweetbay (*Magnolia virginiana*) and highbush blueberry. Groundcover consists of cinnamon fern (*Osmunda cinnamonea*), sensitive fern and jewelweed. Common species in areas subject to inundation include various species of sedge (*Carex sp.*) inclusive of tussock sedge (*Carex stricta*), various species of rush (*Juncus sp.*) inclusive of soft rush (*Juncus effusus*), and jewelweed.

Small areas of scrub/shrub wetland were also found within the wetland forest. These scrub/shrub wetlands are dominated by buttonbush (*Cephalanthus occidentalis*).

Younger woodlands are typically dominated by red maple and sweet gum with understory and ground cover associations similar to those identified with more mature Maple/Gum woodlands. The most substantial young woodlands are located near Devils Brook, along the Amtrak rail lines in the central portion of the Project Impact Corridor, and along Heathcote Brook in the central/western portion of the Project Impact Corridor. Much of the younger woodlands are associated with wetlands or fringes of former agricultural fields.

The Beech/Oak forest, the second most prevalent cover type, is indicative of dryer, upland areas. The common species of this ecosystem include American beech, white oak (*Quercus alba*), sweet gum, red maple, sassafras and chestnut oak (*Quercus prinus*). Other species include grey birch (*Betula populifolia*), black cherry (*Prunus serotina*) and shagbark hickory (*Carya ovata*). The shrub layer is characterized by sweet pepperbush and dewberry. Common groundcover species are ground cedar, Japanese honeysuckle, poison ivy and wood fern (*Dryopteris sp.*).

A transitional zone of Maple/Oak cover occurs between the wetland and upland forests and is represented by red maple, pin oak, sweetgum and red oak. The shrub layer typically consists of spicebush, witch hazel (*Hamamelis virginiana*) and arrowwood. Groundcover is fairly dense in parts with Japanese honeysuckle, poison ivy and patches of fern.

Agricultural Lands

A portion of the Project Impact Corridor consists of agricultural lands primarily used for soybean, corn and pasture/hay production. Agricultural fields are dispersed throughout the Project Impact Corridor with the greatest concentration in the central portion of the corridor. The agricultural lands in the Project Impact Corridor are generally upland in nature as they are situated on well-drained soils, a prerequisite for non-hydric, upland conditions. Finally, there is also a modest cattle ranch in the central portion of the Project Impact Corridor near Friendship and Broadway roads.

The active agricultural fields in the Project Impact Corridor are cultivated in soybean (*Glycine max*) or corn (*Zea mays*), many of which are separated by hedgerows. A typical hedgerow canopy is composed of black cherry, sweet cherry (*Prunus avium*) or Sassafras with a shrub layer of multiflora rose (*Rosa multiflora*), dewberry, black locust saplings (*Robinia pseudoacacia*) and Japanese honeysuckle or poison ivy in the vine stratum. Groundcover consists of common morning glory (*Ipomoea sp.*), field garlic (*Allium vineale*), common fleabane (*Erigeron philadelphicus*), red clover (*Trifollium pratense*), goldenrods (*Solidago sp.*) and common ragweed (*Ambrosia artemisifolia*).

Non-forested, Non-agricultural Lands

The remainder of the Project Impact Corridor consists of developed and landscaped properties. Landscaped corporate parks are concentrated at the eastern and western ends of the Project Impact Corridor in close proximity to Route 130 and Route 1, respectively. Single-family residential development and associated landscaping is scattered throughout the Project Impact Corridor, typically on well drained uplands.

Finally, there is a scattering of early successional fields near the developed areas, the most prominent of such being in the vicinity of U.S. Routes 130 and 32. This area was utilized for pasture, a nursery and was apparently cultivated in the past. Groundcover in the unutilized areas consists of species typical of disturbed areas such as wild carrot (*Daucus carota*), foxtail (*Setaria glauca*), dogbane (*Apocynum androsaemifolium*), goldenrods, common fleabane, and blue toad-flax (*Linaria canadensis*). The nursery area is planted with young blue spruce (*Picea sp.*) and white pine (*Pinus strobus*).

Soils

The soils within the Project Impact Corridor are classified into several associations, each having a distinct pattern of component soils, relief and drainage, culminating in unique natural landscapes. East of the Amtrak railroad tracks, the Project Impact Corridor is dominated by Woodstown-Fallsington-Sassafras and the Sassafras-Woodstown soil associations. Both associations exhibit variable characteristics with nearly level to strongly sloping grades and well drained to poorly drained conditions. The soil associations west of the Amtrak railroad are primarily of the Mount Lucas-Watchung-Chalfont Association, Urban Land-Nixon-Nixon Variants and Keyport-Elkton Associations. Lucas-Watchung-Chalfont Associations are characterized as nearly level to gently sloping soils that can be moderately well drained to poorly drained. Nixon-Nixon Variants are described as well drained urban lands that are nearly level to gently sloping. Keyport-Elkton Associations are nearly level to strongly sloping soils that are deep, moderately well drained to poorly drained soils.

Within the aforementioned soil associations, wetlands, forested uplands, and farmland are the prevalent ecosystems. Wetlands are associated with the hydric soil unit, Fallsington loam (Fb), which parallels Devils Brook and its tributaries and is the primary soil unit in the central portion of the Project Impact Corridor.

Soils of the Nixon series occupy most of the western portion of the Project Impact Corridor from the Amtrak railroad west to Route 27. The soil units within this series are designated as prime farmland in Middlesex County by the Soil Conservation Service and are actively farmed. Although much of the western portion of the Project Impact Corridor is suitable for farmland, wetland areas are associated with Carters and Heathcote Brooks and their tributaries. These wetlands are characterized by Fallsington loam soils as well as Humaquepts, another designated hydric soil. Hydric inclusions such as these are often too small to be included in county soil survey maps.

The eastern end of the Project Impact Corridor consists largely of Sassafras loam (SlA), Sassafras sandy loam (SaC), and to a lesser extent, Matapeake silt loam (MeA) and Mattapex silt loam (MgA).

Hydrology

Three major waterways cross the Project Impact Corridor - Devils, Heathcote and Carter's Brooks. Devils Brook originates at the eastern portion of the Project Impact Corridor near Route 130 in South Brunswick. It flows from east to west through South Brunswick Township before turning south into Plainsboro Township and joining Shallow Brook south of the Project Impact Corridor. There are also numerous minor tributaries, particularly near the north-central portion of the Project Impact Corridor, associated with Devils Brook. Between U.S. Route 1 and Route 27, the Project Impact Corridor is crossed by Heathcote and Carters Brooks.

These waterways provide the major hydrological input for Project Impact Corridor wetlands. The relatively gentle topography, which has a modest slope to the southwest, results in

relatively wide floodplain areas associated with each of the streams and tributaries. These wide floodplain areas are largely manifested as saturated/seasonally flooded wooded wetlands and are potential habitat for the hydrophytic, obligate swamp pink.

3.0 METHODOLOGY

The search for swamp pink was limited to potential habitat and was executed on two levels. Initially, all forested and scrub-shrub wetlands within 500-feet of the centerline of each proposed alignment were visually inspected for the occurrence of *H. bullata*. These inspections took place throughout the months of April and May, when the early-blooming, brightly-colored plant contrasts sharply with an otherwise predominantly green and brown background.

After inspecting each alignment, nineteen (19) representative locations in the Project Impact Corridor were more closely examined to better characterize the habitat (see Figure D-1 for sampling locations). Dominant vegetation within a 30 foot radius of each sampling location was identified, as was approximate percent canopy cover, wetland indicator status and general field observations. Soil data was based upon information from the Freshwater Wetland Letter of Interpretation Request Report, prepared for the proposed project.

In addition to the data collected at each sampling location, plant species observed throughout the entire Project Impact Corridor were recorded.

4.0 RESULTS

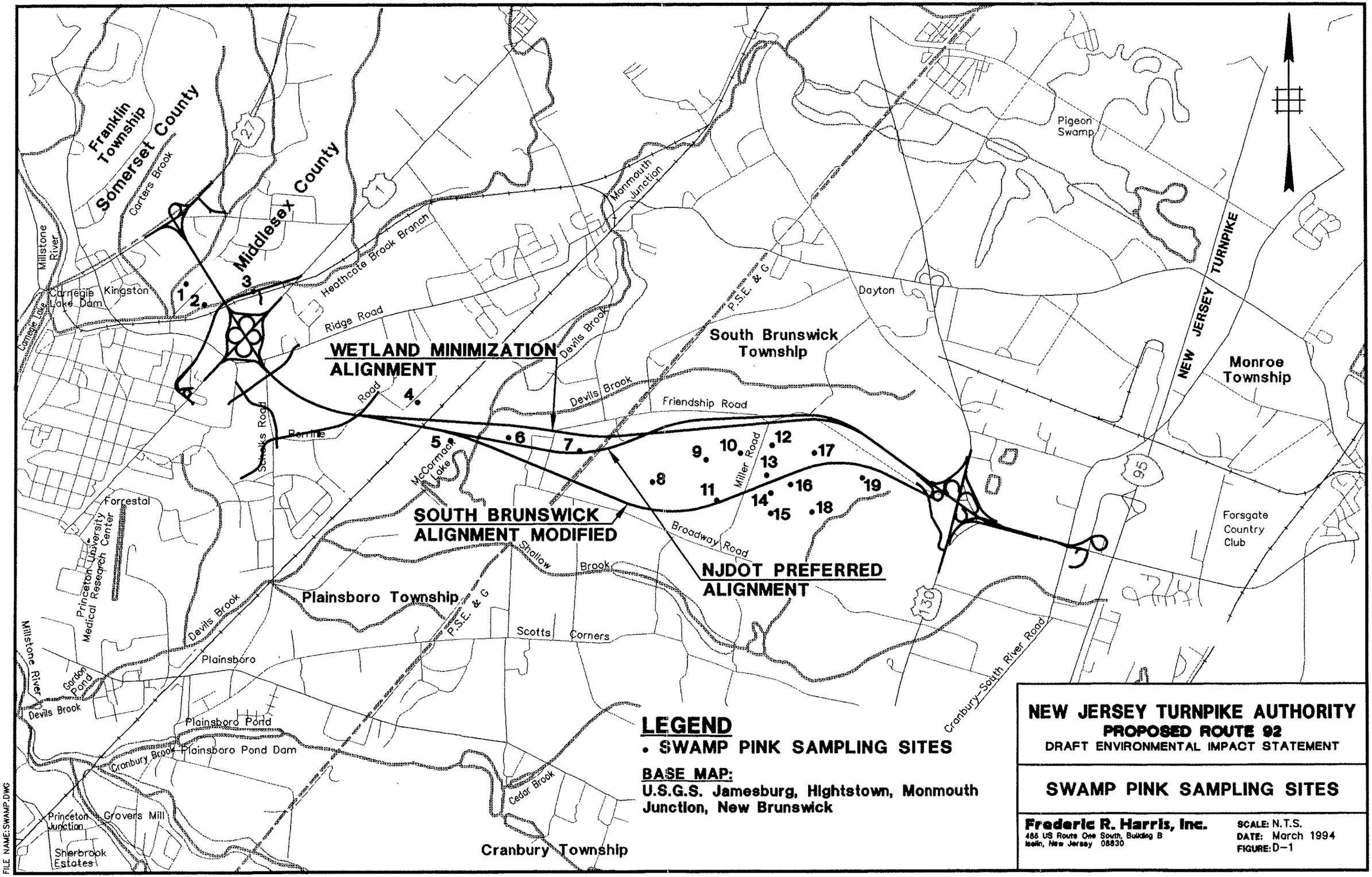
Vegetation

Swamp pink was not detected in any of the forested and scrub-shrub wetlands within 500-feet of the centerline of each proposed alignment nor at any of the nineteen (19) scrutinized, representative sampling sites.

Of the 71 identified hydrophytes in the Project Impact Corridor that are regionally classified as Facultative (FAC), Facultative wetland (FACW) or Obligate wetland, 17 were Obligates (OBL). Of those 17 Obligate species only three - swamp azalea (site 1), skunk cabbage (site 1), and fox sedge (site 6) - were observed within the 19 sampling sites. In addition, burreed (site 11) and spaghnum (site 12) were observed but were not identified to species level. The remaining Obligate species were observed in emergent wetland habitats manifested in swales, ditches and/or shallow depressions.

Soils & Hydrology

The majority of forested wetlands in the Project Impact Corridor are situated on Fallsington loam (Fb) soil. A total of eleven (11) of 19 sampling locations were situated on the Fb unit, which is strongly correlated to the floodplains of Devil's Brook and its tributaries, and less strongly so with Heathcote Brook and its tributaries. Two additional sites were situated on the similar Fallsington sandy loam (Fa) unit. Carter's Brook and its tributaries, as well as the northern floodplain of Heathcote Brook, are situated on the humaquepts, frequently



NEW JERSEY TURNPIKE AUTHORITY
PROPOSED ROUTE 92
DRAFT ENVIRONMENTAL IMPACT STATEMENT

SWAMP PINK SAMPLING SITES

Frederic R. Harris, Inc.
485 US Route One South, Building B
Iselin, New Jersey 08830

SCALE: N.T.S.
DATE: March 1994
FIGURE: D-1

FILE NAME: SWAMP.DWG

flooded (HU) unit, which was represented at sampling site one (1) and the remaining sampling sites were situated on Woodstown loam, 0 to 2 percent slopes (WIA), and Woodstown sandy loam, 2 to 5 percent slopes (WIB). Woodstown soils were often situated adjacent to Fallsington soil on the fringes of floodplains and were not saturated.

According to the Soil Survey of Middlesex County, the permeability of Fb and Fa soils are moderate to moderately rapid and available water capacity is moderate. The seasonal high water table is between the surface and one-foot deep from fall to late spring and the root zone is restricted to 25 inches by wetness. Runoff is slow, organic content is moderate and the poorly drained soil is extremely acid (pH < 4.5) to very strongly acid (pH 4.5-to-5).

5.0 CONCLUSIONS

Fallingston soil, based on its low pH and drainage characteristics, appears to comprise chemical and physical characteristics suited for *H. bullata*. However, the gently sloping topography, relative lack of standing water, absence of drift lines or clear drainage patterns, and wide floodplains associated with the tributaries of the Project Impact Corridor, cumulatively indicate that the requisite hydrology needed to support distinct hydrophytes, such as swamp pink, was not present. Where microtopography was favorable for dominance by obligate wetland species, emergent species not commonly associated with swamp pink were found.

The supposition that the Project Impact Corridor is not "boggy" enough to support swamp pink is most strongly evidenced by the strong dominance of red maple and sweet gum - both Facultative species - and the complete absence of common swamp pink tree associates such as Atlantic white cedar, balsam willow, black spruce, northern white-cedar, poison sumac and Tamarack.

TABLE 1 - VEGETATION OBSERVED IN THE PROJECT IMPACT CORRIDOR

Scientific Name	Common Name	Regional Indicator Status[1]
Acer rubrum	Red Maple	FAC
Achillea millefolium	Yarrow	FACU
Agrostis alba	Red top grass	FACW
Allaria petiolata	Garlic mustard	FACU-
Allium canadense	Meadow onion	FACU
Allium sp.		----
Allipocurus pratensis	Meadow foxtail	FACW
Amelanchier arborea	Downy serviceberry	FAC-
Ambrosia artemisiifolia	Common ragweed	FACU
Andropogon virginicus	Broom-sedge	FACU
Apocynum cannabinum	Indian hemp	FACU
Arisaema triphyllum	Jack-in-the-pulpit	FACW-
Artemesia vulgaris	Mugwort	UPL
Asclepias incarnata	Swamp milkweed	OBL
Asclepias syriaca	Common milkweed	UPL
Aster novae-angliae	New England aster	FACW-
Aster sp.		
Berberis sp.	Barberry	FACU
Betula lenta	Black birch	FACU
Betula nigra	River birch	FACW
Betula populifolia	Gray birch	FAC
Boehmeria cylindrica	False nettle	FACW+
Carex lurida	Shallow sedge	OBL
Carex sp.	sedge	----
Carex stricta	Tussock sedge	OBL
Carex vulpinoidea	Fox sedge	OBL
Carpinus caroliniana	Ironwood	FAC
Carya glabra	Pignut hickory	FACU
Carya ovata	Shagbark hickory	FACU-
Catalpa bignoniodes	Southern catalpa	UPL
Centaurea sp.	Knapweed	
Cephalanthus occidenalis	Buttonbush	OBL
Cinna latifolia	Wood reed grass	FACW
Claytonia virginica	Spring Beauty	FACU
Clethra alnifolia	Sweet Pepperbush	FAC+
Convolvulus arvensis	Field bindweed	UPL
Cornus amomum	Silky dogwood	FACW
Cornus florida	Flowering dogwood	FACU
Cornus stolonifera	Red osier dogwood	FACW+
Cyperus strigosus	Umbrella sedge	FACW

VEGETATION OBSERVED IN THE PROJECT IMPACT CORRIDOR (Cont'd)

Scientific Name	Common Name	Regional Indicator Status[1]
Danthonia sp.	Oatgrass	----
Daucus carota	Queen Anne's lace	UPL
Dichanthelium clandestinum	Deer-tongue witchgrass	FAC+
Elaeagnus angustifolia	Russian olive	FACU
Eulalia viminea	Strawberry bush	FAC
Euonymus alata	Winged euonymus	UPL
Eupatoriadelphus maculatum	Spotted Joe-pye weed	FACW
Eupatorium perfoliatum	Common boneset	FACW+
Euthamia graminifolia	Fragrant goldenrod	FAC
Fagus grandifolia	American beech	FACU
Fragaria virginiana	Common strawberry	FACU
Fraxinus pennsylvanica	Green ash	FACW
Geum sp.	Avens	----
Glycine max	Soybean	UPL
Goodyera pubescens	Rattlesnake plaintain	FACU-
Hamamelis virginiana	American witch-hazel	FAC-
Heracleum lanatum	Cow-Parsnip	FACU-
Hibiscus moscheutos	Rose mallow	OBL
Ilex opaca	American holly	FACU+
Ilex verticillata	Winterberry	FACW+
Impatiens capensis	Jewelweed	FACW
Juncus effusus	Soft rush	FACW+
Juncus tenuis	Slender rush	FAC-
Juniperus sp.	Creeping juniper	----
Juniperus virginiana	Eastern red cedar	FACU
Leersia oryzoides	Rice cutgrass	OBL
Leucothoe racemosa	Fetterbush	FACW
Liqustrum cf. vulgare	European privet	FACU
Linaria canadensis	Blue toad-flax	NL
Lindera benzoin	Spicebush	FACW-
Liquidambar styraciflua	Sweetgum	FAC
Liriodendron tulipifera	Tulip tree	FACU
Lonicera japonica	Japanese honeysuckle	FAC-

VEGETATION OBSERVED IN THE PROJECT IMPACT CORRIDOR (Cont'd)

Scientific Name	Common Name	Regional Indicator Status[1]
Ludwigia alterniflora	Seedbox	FACW+
Lycopodium complanatum	Trailing clubmoss	FACU-
Lycopodium obscurum	Tree clubmoss	FACU
Lycopodium tristachym	Ground pine	NL
Lythrum salicaria	Purple loosetrife	FACW+
Magnolia virginiana	Sweetbay	FACW+
Maianthemum canadense	Canadian mayflower	FAC-
Malus sp.		----
Malus scandens	Climbing hempweed	FACW+
Morus alba	White mullberry	UPL
Muhlenbergia schreberi	Nimble-will	FAC
Myrica pensylvanica	Northern bayberry	FAC
Nasturtium officinale	True water-cress	OBL
Nyssa sylvatica	Blackgum	FAC
Oenothera biennis	Evening primerose	FACU-
Onoclea sensibilis	Sensitive fern	FACW
Osmunda cinnameomea	Cinnamon fern	FACW
Osmunda regalis	Royal fern	OBL
Panicum dichtomiflorum	Fall panic grass	FACW
Panicum sp.	Panic grass	----
Panicum virgatum	Switch grass	FAC
Parthenocissus quinquefolia	Virginia creeper	FACU
Phalaris arundinacea	Reed canary grass	FACW+
Phragmites australis	Common reed	FACW
Phytolacca americana	Pokeweed	FACU+
Pinus abies	Norway spruce	NL
Pinus nigra	Austrian pine	NL
Pinus strobus	Eastern white pine	FACU
Plantago lanceolata	English plantain	UPL
Plantago major	Common plantain	FACU
Poa sp.	Bluegrass	----
Polygonum cespitosum	Bristled smartweed	FACU-
Polygonum pensylvanicum	Pennsylvaniasmartweed	FACW
Polygonum sagittatum	Tearthumb	OBL

VEGETATION OBSERVED IN THE PROJECT IMPACT CORRIDOR (Cont'd)

Scientific Name	Common Name	Regional Indicator Status[1]
Polygonum sp.	Smartweed	----
Populus deltoides	Easteron Cottonwood	FAC
Populus grandidentata	Big-toothed aspen	FACU-
Potentilla simplex	Common cinquefoil	FACU-
Prunus avium	Sweet Cherry	NL
Prunus serotina	Black cherry	FACU
Pteridium aquilinum	Bracken fern	FACU
Pyrola secunda	One-Sided wintergreen	FAC
Quercus alba	White oak	FACU-
Quercus bicolor	Swamp white oak	FACW+
Quercus coccinea	Scarlet Oak	NL
Quercus falcata	Spanish oak	FACU-
Quercus palustis	Pin oak	FACW
Quercus phellos	Willow oak	FAC+
Querucs rubra	Red Oak	FACU-
Quercus cf. velutina	Black Oak	UPL
Rhododendron viscosum	Swamp azalea	OBL
Rhus copallinum	Winged sumac	NI
Rhus glabra	Smooth sumac	NL
Rhus radicans	Poison Ivy	FAC
Rhus typhina	Staghorn sumac	UPL
Robina pseudoacacia	Black locust	FACU-
Rosa multiflora	Multiflora rose	FACU
Rubus allegheniensis	Allegheny blackberry	FACU-
Rubus flagellaris	Blackberry	FACU-
Rudbeckia hirta	Black-eyed susan	NL
Rumex acetosella	Garden sorrel	FACU
Rumex crispus	Curly dock	FACU
Salix nigra	Black willow	FACW+
Sambucus canadensis	Elderberry	FACW-
Sassafras albidum	Sassafras	FACU-
Scripus cyperinus	Wool grass	FACW+
Setaria faberi	Japanese bristle grass	UPL
Setaria glauca	Yellow foxtail	FAC
Smilacina racemosa	False Solomon's seal	FACU-
Smilax rotundifolia	Common greenbrier	FAC

VEGETATION OBSERVED IN THE PROJECT IMPACT CORRIDOR (Cont'd)

Scientific Name	Common Name	Regional Indicator Status[1]
Solanum carolinense	Horse Nettle	NL
Solidago altissima	Tall goldenrod	FACU-
Solidago canadensis	Canada goldenrod	FACU
Solidago gigantea	Giant goldenrod	FACW
Solidago rugosa	Rough-stemmed goldenrod	FAC
Sparganium sp.	Burreed	----
Sphagnum sp.	Sphagnum moss	----
Spirea tomentosa	Steeplebush	FACW
Stellaria media	Starwort	NL
Symplocarpus foetidus	Skunk cabbage	OBL
Taraxacum officinale	Common dandelion	FACU-
Thelypteris noveboracensis	New York fern	FAC
Toxicodendron radicans	Poison ivy	FAC
Trifolium pratense	Red clover	FACU-
Trifolium repens	White clover	FACU-
Trifolium sp.	Clover	----
Typha latifolia	Cattail	OBL
Ulmus americana	American elm	FACW-
Vaccinium corymbosum	Highbush blueberry	FACW-
Verbascum blattaria	Moth mullein	UPL
Verbascum thapsus	Common mullein	UPL
Veronia noveboracensis	New York ironweed	FACW+
Viburnum acerifolium	Mapleleaf viburum	UPL
Viburnum dentatum	Arrowwood	FAC
Viburnum prunifolium	Black haw	FACU
Viola sp.	Violet	----
Vitis sp.	Grape	----
Xanthium spinosum	Spiny cockle-bur	FACU
Zea mays	Corn	----

Note: (1) USFWS National List of Plant Species That Occur in Wetlands: Northeast (Region 1). 1988.

Source: Louis Berger & Associates, Inc., June 1991.

Indicator Status and estimated probability of occurring in wetlands under natural conditions: OBL-Obligate Wetland Plant (67%-99%); FAC-Facultative Plant (34%-66%); FACU-Faculative Upland Plan (1%-33%); NA-Not Applicable due to level of identification; NL-Not Indicated. A (+) indicates a higher probability of being found in a wetland compared to other species within a category and a (-) indicates the opposite.

FREDERIC R. HARRIS, INC.
Metropolitan Corporate Plaza - Building B
485 U.S. Route One South, Iselin, NJ 08830

HARRIS

SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 27, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 1

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 70 SHRUB: 85 HERB: 40 VINE: 40*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	55	FAC	Tree
Quercus palustrus	5	FACW	Tree
Ulmus americana	10	FACW-	Tree
Smilax rotundifolia	30	FAC	Vine
Rhus radicans	10	FAC	Vine
Clethra alnifolia	35	FAC+	Shrub
Lindera benzoin	35	FACW-	Shrub
Rhodendron viscosum	5	OBL	Shrub
Symplocarpus foetidus	5	OBL	Herb
Osmunda cinnamomea	5	FACW	Herb
Onoclea sensibilis	5	FACW	Herb
Impatiens capensis	10	FACW	Herb
Eulalia viminea	10	FAC	Herb

SOILS AND HYDROLOGY

SERIES/PHASE: HUMAQUEPTS. FREQ. FLOODED

MOTTLED: YES GLEYED: YES

INUNDATED: NO

SATURATED: YES

SOIL PROFILE

DEPTH inches	BRIEF DESCRIPTION
0-7	2.5 YR 4/4, 10% mottles (2.5YR 4/2), silty loam
7-12	2.5 YR 4/4, 20% mottles (5 YR 5/1), silty loam
12-18	5YR 5/1, 20% mottles (5YR 6/8), clay loam

FREDERIC R. HARRIS, INC.
Metropolitan Corporate Plaza - Building B
485 U.S. Route One South, Iselin, NJ 08830

HARRIS

SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 27, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 2

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 75* *SHRUB: 35* *HERB: 45* *VINE: 45*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	60	FAC	Tree
Quercus palustrus	5	FACW	Tree
Quercus rubra	5	FACU-	Tree
Liriodendron tulipifera	5	FACU	Tree
Smilax rotundifolia	45	FAC	Vine
Vaccinium corymbosum	30	FACW-	Shrub

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES **GLEYED: NO**

INUNDATED: NO

SATURATED: NO

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-6	10YR 5/2, no mottles, loam
6-12	10YR 5/1, 30% mottles (10YR 5/2), loam
12-18	10YR 7/1, 40% mottles (10YR 6/1), loam w/gravel

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HARRIS

SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 27, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 3

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 65 SHRUB: 30 HERB: 25 VINE: 45*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	50	FAC	Tree
Quercus palustrus	5	FACW	Tree
Cornus stolonifera	5	FACW+	Tree
Rosa Multiflora	30	FACU	Tree
Smilax rotundifolia	15	FAC	Vine
Muhlenbergia schreberi	10	FAC	Herb
Juncus effusus	10	FACW+	Herb

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES GLEYED: NO

INUNDATED: NO

SATURATED: YES

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-4	10YR 5/2, 40% mottles (10YR 5/3), loam
4-18	10YR 5/1, 30% mottles (10YR 5/2), loam, Free-standing water at 4"

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 27, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 4

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 75 SHRUB: 35 HERB: 25 VINE: 45*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	55	FAC	Tree
Quercus palustrus	10	FACW	Tree
Prunus serotina	5	FACU	Tree
Rosa Multiflora	10	FACU	Shrub
Vaccinium corymbosum	25	FAC	Shrub
Smilax rotundifolia	5	FAC	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES GLEYED: NO

INUNDATED: NO

SATURATED: NO

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-2	10YR 3/1, no mottles, loam
2-16	2.5Y 5/3, 40% mottles (2.5Y 5/2), loam
16-20	2.5Y 6/2, 30% mottles (2.5Y 6/3), loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 5

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 75 SHRUB: 45 HERB: 10 VINE: 35*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	55	FAC	Tree
Fraxinus pennsylvanica	15	FACW	Tree
Viburnum dentatum	25	FAC	Shrub
Rosa Multiflora	10	FACU	Shrub
Symplocarpus foetidus	10	FAC	Shrub
Lonicera japonica	10	FAC-	Vine
Smilax rotundifolia	25	FAC	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES GLEYED: NO

INUNDATED: NO

SATURATED: YES (18")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-14	10YR 3/1, no mottles, sandy loam
14-18	10YR 4/1, 10% mottles (10YR 3/1), loamy sand

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 6

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 75 SHRUB: 30 HERB: 5 VINE: _*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	25	FAC	Tree
Fagus grandifolia	10	FACU	Tree
Liriodendron tulipera	10	FAC	Tree
Prunus serotina	5	FACU	Tree
Liquidambar styraciflua	30	FAC	Tree
Clethra alnifolia	25	FAC+	Shrub
Carex vulpinoidea	5	OBL	Herb

SOILS AND HYDROLOGY

SERIES/PHASE: WOODSTOWN SANDY LOAM 2-5% SLOPES

MOTTLED: YES **GLEYED: NO**

INUNDATED: NO

SATURATED: NO

SOIL PROFILE

DEPTH inches	BRIEF DESCRIPTION
0-2	10YR 3/1, no mottles, loam
2-12	2.5Y 6/2, 10% mottles (2.5Y 5/1), silty loam
12-20	10YR 6/1, 30% mottles (10YR 5/6), silty loam

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HARRIS

SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 7

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 85 SHRUB: 20 HERB: 15 VINE: _*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	35/10	FAC	Tree/Sapling
Fagus grandifolia	10/5	FACU	Tree/Sapling
Quercus veluntina	5	UPL	Tree
Quercus bicolor	5	FACW+	Tree
Liquidambar styraciflua	30/10	FAC	Tree/Sapling
Clethra alnifolia	5	FAC+	Shrub
Vaccinium corybosum	15	FACW-	Shrub
Claytonia virginica	15	FACU	Herb

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES GLEYED: NO

INUNDATED: NO

SATURATED: YES (at 20")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-2	10YR 2/1, no mottles, loam
2-18	10YR 7/1, 10% mottles (10YR 6/6), silt
18-20	10YR 6/1, 20% mottles (10YR 6/6), loamy clay

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 8

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 85 SHRUB: _ HERB: 40 VINE: _*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30/10	FAC	Tree/Sapling
Fagus grandifolia	10/10	FACU	Tree/Sapling
Quercus palustris	5	FACW	Tree
Liquidambar styraciflua	40/10	FAC	Tree/Sapling
Thelypteris noveboracensis	25	FAC	Herb
Claytonia virginica	15	FACU	Herb

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES **GLEYED:** NO

INUNDATED: NO

SATURATED: NO

SOIL PROFILE

DEPTH inches	BRIEF DESCRIPTION
0-1	10YR 2/1, no mottles, organic
1-8	2.5Y 6/3, 30% mottles (2.5Y 6/4), loam
8-20	2.5Y 6/2, 20% mottles (10YR 5/6), silty loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 9

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 75 SHRUB: 35 HERB: 5 VINE: _*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30	FAC	Tree
Quercus palustris	15	FACW	Tree
Liquidambar styraciflua	40	FAC	Tree
Prunus serotina	5	FACU	Tree
Vaccinium corymbosum	35	FACW-	Shrub

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES GLEYED: NO

INUNDATED: NO

SATURATED: YES (at 10")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-2	10YR 4/3, no mottles, loam
2-10	10YR 3/1, no mottles, clay loam
10-17	10YR 2/1, no mottles, clay loam
17-24	5Y 6/1, 10% mottles (10YR 5/6), clay

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 10

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 60 SHRUB: 10 HERB: 25 VINE: 10*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30	FAC	Tree
Quercus palustris	15	FACW	Tree
Rosa multiflora	20	FACU	Shrub
Rumex crispus	5	FACU	Herb
Trifolium sp.	10	—	Herb
Dichanthelium clandestinum	15	FAC+	Herb
Vitis sp.	10	—	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: WOODSTOWN SANDY LOAM 2-5% SLOPES

MOTTLED: YES **GLEYED: NO**

INUNDATED: NO

SATURATED: YES (at 6")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-9	10YR 4/2, 15% mottles (5YR 4/6), clay loam
9-15	2.5Y 4/2, 15% mottles (5YR 4/6), clay loam
15-24	5Y 4/1, 15% mottles (5YR 4/6), clay loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 11

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland
PERCENT CANOPY COVER: *TREE: 75 SHRUB: _ HERB: 5 VINE: 10*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30	FAC	Tree
Liquidambar styraciflua	35	FAC	Tree
Allium vineale	2	FACU-	Herb
Sparganium sp.	3	----	Herb
Vitis sp.	10	----	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON SANDY LOAM 0-2% SLOPES

MOTTLED: YES **GLEYED: NO**

INUNDATED: NO

SATURATED: YES (at 24")

SOIL PROFILE

DEPTH inches	BRIEF DESCRIPTION
0-8	2.5Y 4/2, 10% mottles (5YR 4/6), clay loam
8-22	2.5Y 5/2, 15% mottles (10YR 5/6), clay
22-24	2.5Y 5/2, 30% mottles (5YR 4/6), clay

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 28, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 12

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near ponded area
PERCENT CANOPY COVER: *TREE: 75 SHRUB: 25 HERB: 25 VINE: 20*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	25/10	FAC	Tree/Sapling
Liquidambar styraciflua	35/10	FAC	Tree/Sapling
Vaccinium corymbosum	20	FACW-	Shrub
Fagus grandifolia	10	FACU	Tree
Smilax rotundifolia	20	FAC	Vine
Lycopodium obsurum	10	FACU	Herb
Sphagnum sp.	15	—	Herb

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON SANDY LOAM 0-2% SLOPES

MOTTLED: YES **GLEYED: NO**

INUNDATED: YES

SATURATED: YES (at 1")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-9	10YR 4/1, no mottles, clay loam
9-20	10YR 6/1, 20% mottles (10YR 5/6), sandy clay loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 29, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 13

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near ponded area
PERCENT CANOPY COVER: *TREE: 15 SHRUB: _ HERB: 45 VINE: 20*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	10	FAC	Tree
Liquidambar styraciflua	5	FAC	Tree
Onoclea sensibilis	10	FACW	Herb
Allium vineale	5	FACU-	Herb
Trifolium sp.	5	---	Herb
Parthenocissus quinquefolia	10	FACU	Vine
Smilax rotundifolia	10	FAC	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES GLEYED: NO

INUNDATED: NO

SATURATED: NO

SOIL PROFILE

DEPTH inches	BRIEF DESCRIPTION
0-10	10YR 4/1, 25% mottles (7.5YR 4/6), loam
10-16	10YR 5/4, 10% mottles (10YR 6/1), clay loam
16-24	10YR 5/4, 40% mottles (10YR 6/1), sandy loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 29, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 14

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near road edge
PERCENT CANOPY COVER: *TREE: 35 SHRUB: 55 HERB: _ VINE: 5*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Liquidambar styraciflua	30	FAC	Tree
Rumex sp.	10	—	Shrub
Clethra alnifolia	20	FAC+	Shrub
Smilax rotundifolia	10	FAC	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: WOODSTOWN LOAM 0-2% SLOPES

MOTTLED: NO **GLEYED: NO**

INUNDATED: NO

SATURATED: NO

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-6	10YR 3/1, no mottles, loam
6-20	10YR 6/1, no mottles, sandy loam
16-24	2.5Y 6/2, no mottles, sandy loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 29, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 15

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near road edge
PERCENT CANOPY COVER: *TREE:* 75 *SHRUB:* 25 *HERB:* _ *VINE:* _

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30	FAC	Tree
Quercus rubra	10	FACU-	Tree
Fagus grandifolia	10	FACU	Tree
Liquidambar styraciflua	10	FAC	Tree
Clethra alnifolia	20	FAC+	Shrub

SOILS AND HYDROLOGY

SERIES/PHASE: WOODSTOWN LOAM 0-2% SLOPES

MOTTLED: YES **GLEYED:** NO

INUNDATED: NO

SATURATED: YES (at 16")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-2	10YR 3/1, no mottles, loam
2-20	2.5Y 6/2, 30% mottles (2.5Y 6/3), sandy loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 29, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 16

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near road edge
PERCENT CANOPY COVER: *TREE: 35 SHRUB: 25 HERB: _ VINE: _*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Nyssa sylvatica	20	FAC	Tree
Quercus rubra	10	FACU-	Tree
Fagus grandifolia	10	FACU	Tree
Liquidambar styraciflua	10	FAC	Tree
Clethra alnifolia	20	FAC+	Shrub

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: YES **GLEYED:** NO

INUNDATED: NO

SATURATED: YES (near surface)

SOIL PROFILE

DEPTH inches	BRIEF DESCRIPTION
0-6	10YR 5/1, 40% mottles (10YR 5/1), loam
6-20	10YR 6/1, 5% mottles (10YR 5/6), clay loam

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 30, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 17

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near road edge
PERCENT CANOPY COVER: *TREE: 75* *SHRUB: 45* *HERB: 10* *VINE: 10*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30	FAC	Tree
Liquidambar styraciflua	30	FAC	Tree
Vaccinium corymbosum	15	FACW-	Shrub
Hammamelis virginiana	15	FAC-	Shrub
Smilax rotundifolia	10	FAC	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: FALLSINGTON LOAM

MOTTLED: NO **GLEYED:** NO

INUNDATED: NO

SATURATED: YES (at 12")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-1	Organic material
1-10	10YR 3/1, no mottles (10YR 5/6), sandy clay loam
10-20	2.5Y 5/2, no mottles, sand

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SWAMP PINK SURVEY DATA SHEET

PROJECT: Proposed Route 92
SITE LOCATION: As shown on map
CLIENT: New Jersey Turnpike Authority

DATE(S): April 30, 1993
INVESTIGATOR(S): M. Terenzi & C. Hicks
SEARCH AREA: 18

VEGETATION

PLANT COMMUNITY CLASSIFICATION: Broad-leaved, deciduous forested wetland near road edge
PERCENT CANOPY COVER: *TREE: 65 SHRUB: 45 HERB: 10 VINE: 15*

DOMINANT PLANT SPECIES	% AREAL COVER	INDICATOR STATUS	STRATUM
Acer rubrum	30/10	FAC	Tree/Sapling
Fagus grandifolia	10	FACU	Tree
Vaccinium corymbosum	15	FACW-	Shrub
Clethra alnifolia	10	FAC+	Shrub
Smilax rotundifolia	15	FAC	Vine

SOILS AND HYDROLOGY

SERIES/PHASE: WOODSTOWN SANDY LOAM 2-5% SLOPES

MOTTLED: YES **GLEYED:** NO

INUNDATED: NO

SATURATED: YES (at 18")

SOIL PROFILE

DEPTH Inches	BRIEF DESCRIPTION
0-4	10YR 2/1, no mottles, organic
4-12	10YR 5/2, 30% mottles (10YR 5/3), clay loam
12-20	10YR 5/1, 20% mottles (10YR 5/2), clay loam

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.

18 COMMERCE STREET PLAZA • FLEMINGTON, NJ 08822
(908) 788-9676 • FAX (908) 788-6788
PA (610) 250-0773

WILDLIFE INVENTORY

FOR

PROPOSED ROUTE 92
NEW JERSEY TURNPIKE AUTHORITY

MONROE, SOUTH BRUNSWICK AND PLAINSBORO TOWNSHIPS
MIDDLESEX COUNTY, NJ

FEBRUARY 5, 1996

Submitted to:

Frederic R. Harris, Inc.
Metropolitan Corporate Plaza
Office Building B
485 US Route One South
Iselin, NJ 08830

Prepared by:

AMY S. GREENE ENVIRONMENTAL
CONSULTANTS, INC.

Project #1244

EXECUTIVE SUMMARY

Amy S. Greene Environmental Consultants, Inc. (ASGECI) was contracted by Frederic R. Harris, Inc. (FRH) to perform an endangered and threatened species and general wildlife inventory and to assess impacts from the proposed Route 92 on wildlife populations within the proposed right-of-way (ROW) and adjacent areas within 300 feet (on either side) of the proposed ROW - the "project area". The proposed highway consists of the reconstruction of Route 32 to provide a roadway consisting of two through lanes, weaving and acceleration/deceleration lanes plus shoulders in each direction between NJ Turnpike Interchange 8A and NJ Route 130, and the construction of a new, limited access, four-lane roadway (two lanes plus shoulders in each direction), Route 92, between Route 130 and Route 1. The Interchange 8A toll plaza will also be enlarged. The alignment will pass through the Townships of South Brunswick and Plainsboro in Middlesex County, NJ. Improvements in the vicinity of Interchange 8A are located in Monroe Township.

The proposed Route 92 alignment has been termed the "Wetlands Minimization Alignment", as it disturbs the lowest acreage of wetlands of the five alignments previously studied. These five alignments include the following: 1) Alignment A - the NJDOT North Scheme; 2) Alignment B - the NJDOT Preferred Alternative; 3) Alignment C - the NJDOT South Scheme; 4) Alignment D - the South Brunswick Preferred Alignment; and 5) Alignment E - the Wetlands Minimization Alignment. The Wetlands Minimization Alignment is also the furthest from McCormack Lake, a 46-acre, man-made lake located south of the central portion of the alignment. McCormack Lake is associated with a large amount of critical wildlife habitat.

Species of Concern (SOCs) for the project area were determined based on written recommendations from the New Jersey Department of Environmental Protection (NJDEP) Division of Fish, Game and Wildlife. The list of SOCs provided by NJDEP included 18 avian species, two amphibians (turtles), and three invertebrate (mussel) species. The NJDEP Natural Heritage Program was also consulted.

The scope of the study included the following:

1) Habitat mapping within and immediately adjacent to the alignment;

2) Survey of scientific literature on SOC habitats to determine the extent of potentially suitable habitat within the project area and to formulate search methodologies;

3) Limited field surveys for

   a. the SOCs; and

   b. documentation of the species utilizing the habitats within and around the alignment;

4) Assessment of potential impacts to wildlife from the proposed highway.

Field investigations utilized various survey methods to determine the presence of SOCs within the study area. The "study area" was determined from the extent of potential habitat in the project area and similar contiguous habitat that extended outside the project area. Therefore, the study area extended beyond the project area along some sections of the alignment. These investigations took place in mid-June through early August, and early October, 1995. Approximately twelve days of field survey were performed.

Based upon the literature search and field habitat mapping, a rating index of potentially suitable habitat for each of the SOCs was developed. Habitat suitability was rated from 0 (no potential) to 4 (high potential). As a result of the above investigations, it was concluded that there is no potentially suitable habitat on, or within 300 feet of, the project site for pied-billed grebe, American bittern, osprey, peregrine falcon, bog turtle, brook floater or yellow lampmussel. In addition, there is no breeding habitat for great blue heron or northern harrier, although there is potentially suitable feeding habitat for these species. Potentially suitable habitat for red-headed woodpecker, grasshopper sparrow, Henslow's sparrow, and triangle floater was determined to be minimal. It was noted, however, that McCormack Lake and its environs, the northernmost arm of which is located approximately 1000 feet south of the central portion of the proposed ROW alignment, could provide suitable habitat for pied-billed grebe, American bittern, osprey and mussels.

There is potentially suitable habitat of low to high potential within the limits of the study area for Cooper's hawk, red-shouldered hawk, upland sandpiper, barred owl, cliff swallow, loggerhead shrike, vesper sparrow, savannah sparrow, bobolink, and wood turtle. Although there is potentially suitable habitat for these SOCs within the study area, most of these species (or signs thereof) were not observed during our field investigations. Only one SOC (great blue heron) was directly observed and one SOC (Cooper's hawk) was thought to be heard within the project area. However, field investigations were limited (12 days) and did not take place during optimal observation time frames for all of the SOCs. Therefore, while we may conclude that some of these species are not present within

the project area, based on the absence of suitable habitat, some SOCs may utilize habitat or merely be easier to observe within the project area at other times of the year. Cooper's hawk, barred owl, upland sandpiper, savannah sparrow and bobolink were determined to be the most likely to inhabit the study area based on the presence of potentially suitable habitat and reported sightings by others.

The main impacts of the proposed project to wildlife in general would be from the destruction or degradation of wetland and upland forest, upland early successional field, and hedgerows. Direct destruction will occur from the construction activities within the ROW. The majority of this habitat destruction will be permanent. This will result in the loss of nesting, resting, and feeding habitat within the ROW. Degradation impacts include fragmentation of contiguous habitats and noise and human activity impacts resulting from both construction and the use of the highway. This could result in avoidance of the area by sensitive migratory and resident species, and direct mortality of wildlife attempting to cross the highway. Of the endangered and threatened species likely to be present in the project area, barred owl is the most likely to be affected by the project due to forest fragmentation and increased human activity. Other potential impacts include alteration of the water quality or volume of the Devil's Brook which could impact fish, reptiles and amphibians that depend on this open water habitat for the continuation of their life cycle. Overall impacts to potential habitat for the other species have been minimized; however, the potential for impacts could be further reduced by the following recommendations:

1) A wetland mitigation plan should be prepared for the project, in accordance with the New Jersey Freshwater Wetlands Protection Act, to mitigate for the loss of wetland habitats for the endangered and threatened species potentially impacted by the project.

2) The use of bridges that span an area of land in addition to the Devil's Brook and railroad crossings would be beneficial for allowing wildlife movement through forest corridors. The preliminary plans for the project include a 500' bridge span over the Devil's Brook, and a 400' bridge span over the railroad line. Bridging these areas of forested wetlands will not only permit continued access to the fields and lake by wildlife, but will decrease wetland and stream impacts as well. A planted barrier or fencing should be used along adjacent areas of the highway outside of the wetlands to help funnel wildlife to the bridged areas.

3) Box culverts should be used in permanent streams that are not bridged to allow fish passage. Construction activities in streams should be limited to late summer (late July - early September) to avoid impacts to wood turtles and spawning fish. The bottom of the culverts should be set below the natural streambed and then lined with natural materials.

4) Fragmentation of the field north of McCormack Lake could potentially impact wildlife in the area and should be avoided if feasible. Shifting the alignment above McCormack Lake to the north of the existing treerow would avoid fragmentation of this important upland, early successional field. The benefits gained by avoiding the fragmentation of the field would need to be weighed against increased wetland impacts, the potential for an additional stream crossing due to this change, and potential increased residential takings.

5) A stormwater management plan for the project should be prepared with the intention of minimizing potential impacts to water quality or volume of the Devil's Brook, thereby minimizing impacts to fish, reptiles and amphibians. Periodic maintenance of stormwater management facilities should be adhered to in order to ensure that water quality in the vicinity is not compromised.

Except in the Pinelands and CAFRA Areas, New Jersey does not have regulations specifically protecting upland-dwelling animals from habitat degradation. Therefore, environmental constraints due to endangered and threatened species are imposed mainly by the limits to development in wetlands and wetland transition areas. The NJ Freshwater Wetlands Act provides that any wetlands which are documented habitat for endangered or threatened species are classified as exceptional resource value wetlands and are subject to 150-foot transition areas. Some of the wetlands within the project area may be classified as exceptional resource value due to the presence of potentially suitable habitat for some endangered species. This will be determined by NJDEP in the Letter of Interpretation pending for the project. Requirements for transition area waivers and permits are more stringent for exceptional resource value wetlands.

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I. INTRODUCTION

This report summarizes the findings of an endangered and threatened species and general wildlife inventory within the proposed Route 92 ROW and adjacent areas within 300 feet (on either side) of the proposed ROW - the "project area". A limited amount of field work was performed to identify wildlife during the preparation of the Environmental Impact Statement (EIS) by Frederic R. Harris, Inc. During review of the EIS, the NJDEP Division of Fish, Game and Wildlife expressed concern that potential impacts to wildlife, particularly threatened and endangered species, may have been underestimated. Amy S. Greene Environmental Consultants, Inc. (ASGECI) was contracted to perform additional qualitative wildlife surveys and habitat evaluations in order to properly assess the potential impacts to wildlife along the proposed alignment.

The project area is located in Monroe, South Brunswick and Plainsboro Townships, in Middlesex County, NJ and runs generally east-west between the New Jersey Turnpike and US Route 1 (Figure 1). The proposed highway consists of the reconstruction of Route 32 to provide a six-lane roadway (three lanes plus shoulders in each direction) between NJ Turnpike Interchange 8A and NJ Route 130 and the construction of a new, limited access, four-lane roadway (two lanes plus shoulders in each direction), Route 92, between Route 130 and Route 1. The Interchange 8A toll plaza will also be enlarged by eight additional lanes, and a new, barrier-type toll plaza will be constructed on the west side of Route 130. The Interchange 8A/Route 32/Cranbury-South River Road intersection will be reconstructed and new interchanges will be constructed at Route 130, Perrine Road and Route 1. The alignment will pass through the Townships of South Brunswick and Plainsboro in Middlesex County, NJ. Improvements in the vicinity of Interchange 8A are located in Monroe Township. The site is located in the Piedmont physiographic province (USGS Geological Map, 1992). Topography is generally level with elevations ranging between 120 and 140 feet National Geodetic Vertical Datum (Figure 1).

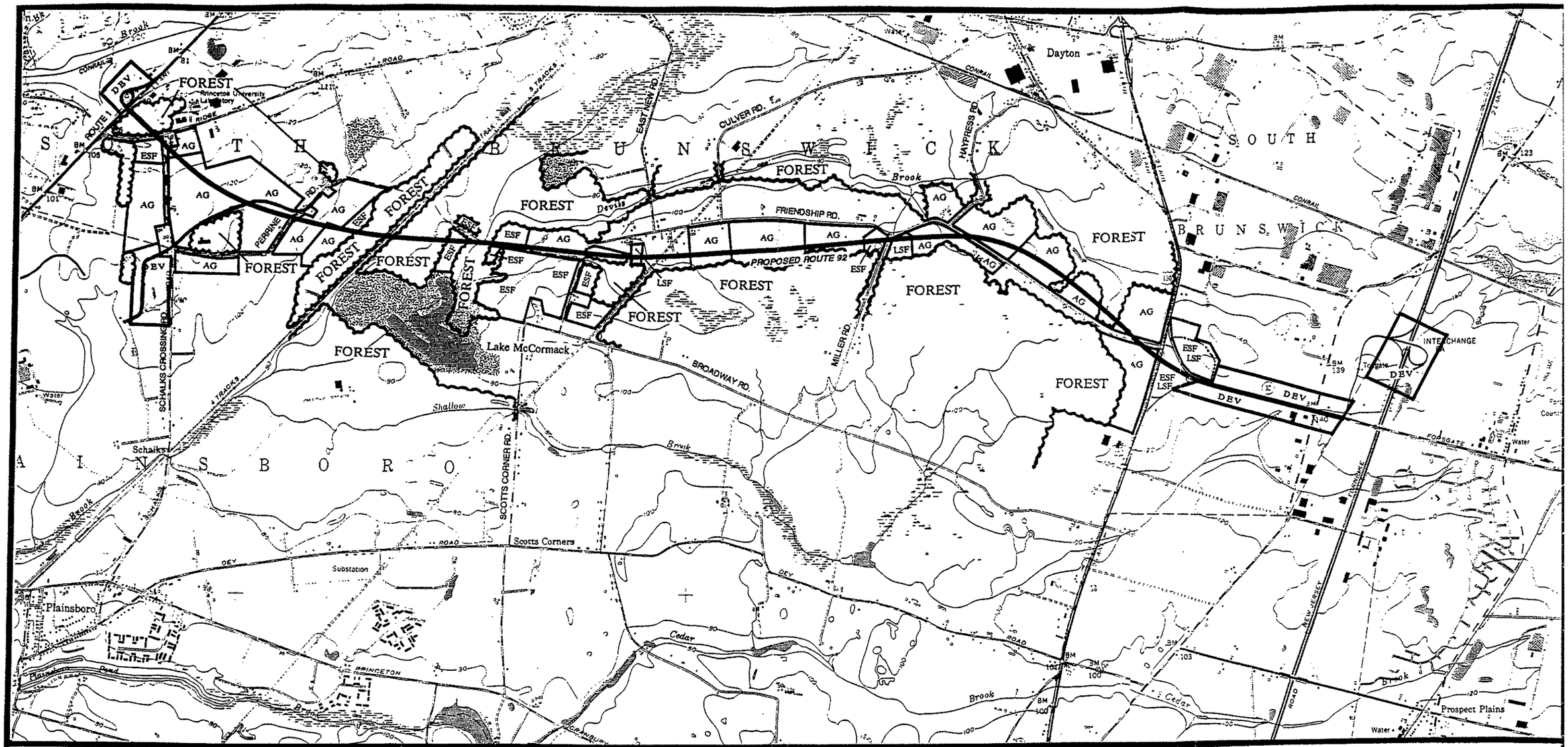
Land use surrounding the project area consists of forest and commercial development to the west, forest and farmland to the north and south, and office and commercial complexes to the east. The area through which the alignment passes consists of agricultural land, mowed and unmowed early and late successional fields, upland and wetland forested areas and hedgerows. The alignment crosses the Devil's Brook and associated forested wetland in the approximate central portion.

Within the project area, the area between the New Jersey Turnpike and Route 130, at the eastern end of the alignment

is highly developed. Because of this, the wildlife study focused on the portion of the project area between Route 130 and Route 1. The western terminus of the alignment, at Route 1, is also developed. The area between Route 130 and the curve in Friendship Road (curve located approximately 1/3 mile west of the Friendship Road/East New Road intersection) is mainly agricultural land (corn and soybeans), and the area between Perrine Road and Route 1 consists of a combination of agricultural and developed land.

The approximate central portion of the project area, between Friendship and Perrine roads, while partially in agriculture, has limited access and is essentially undisturbed. This area contains upland and emergent wetland fields, streams and forested wetland. While there is certainly wildlife habitat throughout the alignment, it is this central area that contains the most valuable and varied habitat types.

This report presents information on the species of concern, on wildlife utilizing the study area, on habitats throughout the alignment, survey methodologies, results, a discussion of impacts from the proposed project, and recommendations for minimizing wildlife impacts. Endangered and threatened species of concern were determined through coordination with the NJDEP Division of Fish, Game and Wildlife, and information obtained from the NJDEP Natural Heritage Program. A literature search and field surveys were performed.



LEGEND:

AG	AGRICULTURAL FIELDS
ESF	EARLY SUCCESSIONAL FIELD
DEV	DEVELOPED LAND
LSF	LATE SUCCESSIONAL FIELD
	FOREST BOUNDARIES
	FIELD BOUNDARIES
	PROPOSED ROUTE 92

NOTE: Habitat types were determined from the review of current aerial photographs and field verification by Amy S. Greene Environmental Consultants, Inc.

SOURCE: USGS 7.5 Topographic Series Map, Hightstown and Jamesburg, NJ Quadrangles.

N

0 2500'

FIGURE 1
STUDY AREA AND HABITAT MAP

South Brunswick, Plainsboro & Monroe Townships
Middlesex County, NJ
ASGECI Project #1244

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.

II. METHODOLOGY

A. Literature/Agency Information Review

A list of endangered, threatened and rare wildlife species of concern (SOCs) potentially present within the project area was provided by the NJDEP Division of Fish, Game and Wildlife (Appendix B). These were the species focused on in this study. These species are as follows:

Common Name	Latin Name	State Status
pied-billed grebe	*Podilymbus podiceps*	E/S
great blue heron	*Ardea herodias*	T/S
American bittern	*Botaurus lentiginosus*	T/S
osprey	*Pandion haliaetus*	T/T
Northern harrier	*Circus cyaneus*	E/U
Cooper's hawk	*Accipiter cooperii*	E/E
red-shouldered hawk	*Buteo lineatus*	E/T
peregrine falcon	*Falco peregrinus*	E
upland sandpiper	*Bartramia longicauda*	E
barred owl	*Strix varia*	T/T
red-headed woodpecker	*Melanerpes erythrocephalus*	T/T
cliff swallow	*Hirundo pyrrhonota*	T/S
loggerhead shrike	*Lanius ludovicianus*	E
vesper sparrow	*Pooecetes gramineus*	E
savannah sparrow	*Passerculus sandwichensis*	T/T
grasshopper sparrow	*Ammodramus savannarum*	T/T
Henslow's sparrow	*Ammodramus henslowii*	E
bobolink	*Doolichonyx oryzivorus*	T/T
wood turtle	*Clemmys insculpta*	T
bog turtle	*Clemmys muhlenbergi*	E
triangle floater	*Alasmidonta undulata*	rare
brook floater	*Alasmidonta varicosa*	rare
yellow lampmussel	*Lampsilis cariosa*	rare

Notes: E = Endangered. T = Threatened. S = Stable. U = Undetermined. Where there are two letters (e.g., E/E), the first refers to the breeding populations and the second to the migratory or winter populations.

The peregrine falcon is a Federal-listed endangered species. The loggerhead shrike, Henslow's sparrow, bog turtle, brook floater and yellow lampmussel are candidates for Federal listing.

The New Jersey Natural Heritage Program (NJNHP) was consulted to identify species in their database that have been previously reported in the vicinity of the project. A listing of endangered and threatened species reported in the Hightstown and Jamesburg USGS quadrangles, in which the project area is located, was also obtained to identify species known to occur in the region (Appendix C).

A literature search was undertaken in order to ascertain identifying features, habitat preferences, parameters that would constitute potentially suitable habitat, and the best time of year and applicable search methodologies to use to survey for each of the SOCs. Aerial maps and site survey maps were reviewed prior to and following field investigations to determine and document the locations and extents of potentially suitable habitats for the SOCs.

Mr. Jim Sciasca, Mr. Michael Valent and Ms. Jeanette Bowers-Altman of the NJDEP Division of Fish, Game and Wildlife were also consulted regarding habitat usage, search methodologies, and the best time period to survey for certain species (see conversation logs - Appendix B). Mr. Larry Torok and Ms. Sherry Meyer of the Division provided additional information regarding the suitability of the project area habitat for barred owl, Cooper's hawk, wood turtle and bog turtle. Mr. Dave Jenkins (NJDEP) was consulted for information regarding great blue heron and Cooper's hawk populations, and Ms. Kathy Clark (NJDEP) provided information on the peregrine falcon. Habitat Suitability Index Models, prepared by the US Fish and Wildlife Service, for barred owl and osprey were also consulted.

An Ecological Resource Inventory (ERI) of the Turkey Island Corporation property, prepared by Eastern States Environmental Associates, Inc. (Fishback, 1994) was reviewed extensively. The ERI covered an 817-acre study area, the northernmost portion of which coincides with the central portion of the Route 92 project area. The ERI study area is bounded by the Penn-Central (Amtrak) Railroad tracks to the west, Scott's Corner and Friendship Road to the east, and the Shallow Brook to the south. South Brunswick parklands, north of the Devil's Brook, form the northern boundary. The ERI included McCormack Lake, a 46-acre man-made lake. This lake is located approximately 1000 feet south of the Route 92 alignment, outside of the proposed Route 92 project area. The ERI contains a compilation of over 1700 hours of research and 700 hours of field investigation conducted over a period of one year, and documents all rare, threatened and endangered species observed within that time.

B. Field Investigations

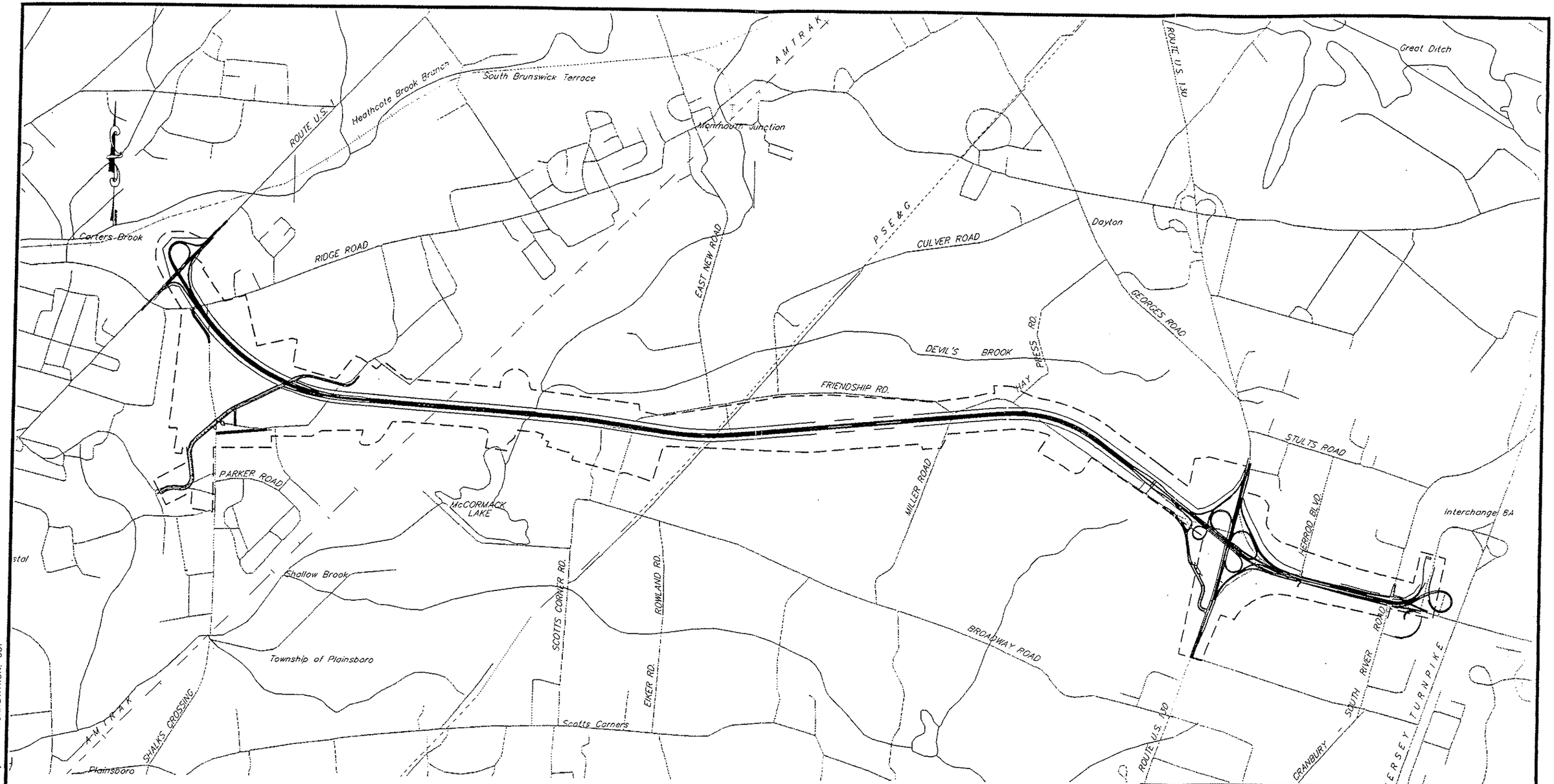
In June 1995, the entire project area was walked in order to verify vegetative cover types (e.g., forest, agricultural field, late successional field, etc.) within up to 300 feet on either side of the proposed ROW. Limits of areas investigated were identified in the field using digitized mapping prepared by Frederic R. Harris, Inc. Since the majority of the alignment passes through open fields of various types, each distinct field area was investigated as a separate potential habitat unit. Field mapping from these

site walks was then used to help determine the location and quality of habitat for each of the SOCs. The "study area" for wildlife (including SOCs) searches was determined from the extent of potential habitat in the project area and similar contiguous habitat that extended outside the project area. For example, if an early successional field habitat unit was present within 300 feet of the proposed ROW, but also extended beyond this limit, and was determined to be potentially suitable habitat for one or more SOCs, the field was searched up to the first reasonable break point outside of the project area. Therefore, the study area extended beyond the project area along some points of the alignment. Figure 2 presents the limits of the study area.

Subsequent visits to the study area were made to perform rare species and general wildlife surveys in mid-June, July and early August 1995. Additional visits to the wetlands in the central portion of the site were made in early October, 1995 to survey these areas for wood and bog turtles. Table 1 presents the dates, times and personnel involved on each field survey. Resumes of the persons involved in these searches and in the preparation of this report are presented in Appendix D. During field surveys for general wildlife, Species of Concern were searched for where habitat was deemed appropriate.

Searches were conducted only for those SOCs for which it was determined that any potentially suitable habitat existed within the study area. Surveys for the SOCs were conducted in accordance with published methodologies. In general, walking meander surveys through potentially suitable habitat were used to search for turtles and raptors. Transect surveys were used for grassland birds. A call and response survey was used for barred owl. No intensive search for mussels was conducted due to the limited potential for habitat within the project area. The identification of freshwater mussel species requires primarily the use of shell characteristics, but other characteristics such as gill color, stomach anatomy, etc. may also be important. Since many species are polymorphic in shell characters, differences occur even among individuals within populations extending from headwaters to river mouths. This causes difficulties for even professional taxonomists, and reliable species identification should be sought from professional malacologists (Terwilliger, 1991). This level of identification is beyond the scope of this investigation.

In addition, all wildlife observed or heard during the field investigations and the habitat in which observed was recorded on wildlife observation sheets (Table 3, Appendix A). Specific search methodologies for each of the SOCs searched for are described below.



LEGEND:

— — — — WILDLIFE INVENTORY STUDY AREA BOUNDARY

NEW JERSEY TURNPIKE AUTHORITY
ROUTE 92
WILDLIFE INVENTORY

STUDY AREA

Frederic R. Harris, Inc.
Iselin, New Jersey 08830

SCALE: 1" = 2500'
DATE: February 1996
Figure 2

X-REF'S: QUADBASE_92FRMT-B_ALIGN92
LAST EDIT: 02/02/96 08:29 AM
PROJECT: 3150-03 FILE NAME: G:\3150\03\ENV\CH01 WORKSTATION: 001

TABLE 1
FIELD SURVEY INFORMATION

Field Survey Conducted for	Approximate location of Survey	Date and time of Survey	Personnel conducting Survey
Bobolink, General wildlife	Upland fields between US Route 1 and Friendship Road	June 13, 1995 8:30 AM – 4:00 PM	L. Roche R. Riberdy
Bobolink, General wildlife	Upland fields between Friendship and Cranberry Roads	June 14, 1995 8:30 AM – 4:00 PM	L. Roche R. Riberdy
General wildlife	Study area between NJ Tpk. and Miller Road	June 30, 1995 9:40 AM – 3:50 PM	L. Brave M. Brancheau
General wildlife	Study area between Miller Road and Devils Brook	July 6, 1995 9:30 AM – 4:00 PM	L. Brave M. Brancheau
Grassland SOC's, Cooper's and Red–shouldered hawks, Northern harrier and Loggerhead shrike	Turkey Island fields, forest edges, hedgerows and barbed–wire fencelines	July 7, 1995 6:30 AM – 10:15 PM	L. Brave M. Brancheau
General wildlife	Study area between Devils Brook and US Route 1	July 12, 1995 9:50 AM – 4:00 PM	L. Brave M. Brancheau
Grassland birds and Raptors	Agricultural fields, treerows and hedgerows between US Route 1 and railroad line	July 19, 1995 6:00 AM – 10:15 AM	L. Brave M. Brancheau

TABLE 1
FIELD SURVEY INFORMATION

Field Survey Conducted for	Approximate location of Survey	Date and time of Survey	Personnel conducting Survey
Barred owl	5 points within Forested areas located between Perrine Road and Georges Road	July 19/20, 1995 8:00 PM – 12:30 AM	L. Brave M. Brancheau
Grassland birds, Raptors, Woodpecker and Loggerhead shrike	Turkey Island fields, forest edges, hedgerows and barbed–wire fencelines	July 20, 1995 5:45 AM – 11:00 AM	L. Brave M. Brancheau
Grassland birds, Raptors, Woodpecker and Loggerhead shrike	Turkey Island fields and forest edges; and Cedar forest between Ridge Road and US Route 1	August 4, 1995 5:45 AM – 11:00 AM	M. Brancheau P. Lupini
Wood turtle and Bog turtle	Forested wetlands in Devil's Brook area – Turkey Island prop.	October 3, 1995 9:30 AM – 1:30 PM	L. Brave W. Smejkal
Wood turtle and Bog turtle	Forested wetlands in Devil's Brook area – Turkey Island prop.	October 10, 1995 10:30 AM – 2:30 PM	L. Brave W. Smejkal

Wood and Bog Turtles

Forested wetlands along the Devil's Brook and adjacent forested and open areas were searched for wood turtles. April through June is the best time to search for wood turtles, due to their expected movement between stream corridor (winter hibernacula habitat), open fields (nesting habitat), and woodland (summer feeding/resting habitat) at that time. Since field surveys could not be initiated until June, field searches for wood turtle were performed in early October when the turtles would be expected to begin movement back to the stream corridors. Research has indicated that streamside searches between the hours of 11:00 a.m. and 1:00 p.m. in April, May and October are the most likely to yield results (Farrell and Zappalorti, 1979). Because the survey methodology for bog turtle is similar to that of wood turtle, searches for the two species were performed concurrently. Two field ecologists performed streamside searches of all potentially suitable habitat within the project area between the hours of 9:30 a.m. and 1:00 p.m. on October 3 and 10, 1995. Wetlands associated with the Devil's Brook, within the project area, were walked in separate zigzag patterns by the two field personnel. Sticks were used to move vegetation that turtles might use for cover, and to poke under undercut banks and roots. Adjacent upland fields were also searched for roaming turtles and shells of turtles that may have died during the nesting season.

Barred Owl

Forested uplands and wetlands were searched for barred owls. A methodology published in a letter by NJDEPE, Division of Environmental Regulation, Land Use Regulation Program (February 25, 1994) was used to search for barred owls on a very calm evening in July from approximately 8:00 p.m. to 12:30 a.m.. This method involves the use of an audiotape player to broadcast barred owl vocalizations and listening for responses. The 1994 NJDEPE letter states that while barred owls respond to tape calls throughout the year, the period from March through July has been documented to result in greater owl response success. The letter also noted that the survey should be performed after sunset when winds are less than 8 mph and there is little or no precipitation. During the survey, the tape was broadcast from four stations located in the forested areas within the study area determined to be potential habitat. Each broadcast consisted of six 10-second sets of barred owl vocalizations separated by 1 minute of active listening. The tape player was rotated 180 degrees between each 10-second interval. Each complete broadcast was preceded and followed by 5 minutes of active listening. Approximately twenty minutes were spent at each station. Time was also spent listening for owls between stations.

Grassland Birds

Late spring (May and June) is the best time to survey for grassland bird species. They are migratory and historically arrive in New Jersey and establish breeding territories by this time. Territorial birds are vocal and thus easily observed. Although field surveys began in mid-June, the grassland birds should still have been present, but possibly less evident at this time.

Pre-determined transect lines were located in 40 open fields (many agricultural) and early successional field areas. As many as five transects were located in larger fields and fields with greater habitat potential. One to two transects were located in small fields and active soybean fields, as sight distance is greater and habitat potential is lower in these fields. The transects were walked in the early hours of morning (approximately 6:00 a.m. to 10:00 a.m.) to search for grassland bird species, which included upland sandpiper, vesper sparrow, savannah sparrow, grasshopper sparrow, Henslow's sparrow and bobolink. Stops were made along the transect at predetermined points. At least five minutes were spent at each of these points in order to make more detailed observations. Some of these points were located in late successional field areas, along fencelines and hedgerows, or along forested edges in order to get a more complete listing of wildlife in the study area, and to include potential habitat for raptors, loggerhead shrike and red-headed woodpecker. Meander searches of fields determined to have higher habitat potential were used to supplement the transect searches. While most of the agricultural fields were surveyed only once or twice (due to a determined lack of suitable habitat), fields determined to provide higher potential for habitat were each surveyed on three to four different mornings.

Raptors

The optimum time to survey for raptors is during the spring nesting season. Raptors observed during site visits from June through August were identified either aurally or visually during meander and transect searches performed on the same days as the grassland bird surveys. It was expected that if Cooper's or red-shouldered hawks were present, they would either be heard or seen, most likely in forested areas adjacent to fields. Therefore, the field investigations for raptors generally coincided with the early morning field surveys for grassland birds. Additional searches of forested habitat were performed following the early morning open field searches.

Loggerhead shrike

Habitat for loggerhead shrike, including cedar forest, fencelines and hedgerows, was walked to search for the loggerhead shrike or signs of its presence, including impaled insects. Hedgerows were walked in all fields during

or following the early morning, grassland bird, field surveys. The cedar forest area, located between Ridge Road and US Route 1, was walked once in the early morning and once in mid-afternoon on two separate days.

III. RESULTS

A. Habitat/Vegetative Communities

Approximately 15% of the project area, primarily to the east, is developed land, which is paved, landscaped (mowed regularly), or otherwise disturbed. Approximately 15% of the site consists of early to late successional fields. Approximately 20% of the project area is forested. The remaining 50% of the project area consists of agricultural fields. For the purposes of this report, the term "agricultural" refers to the production of corn, soybeans or oats only. Hay fields and grass fields used for grazing cattle, are included as early successional fields. Figure 1 depicts the locations of each of these vegetative communities.

Developed land is located primarily in the area between the New Jersey Turnpike and Route 130, at the eastern end of the alignment. The western terminus of the alignment, at the intersection of US Route 1, is also highly developed. The area between Perrine Road and Route 1 consists of a combination of agricultural and developed land. Most of these areas contain no potential habitat for rare species. One field, located east of Route 130, north of Route 32 was determined to have minimal potential for bobolink. The forested area east of US Route 1, west of Ridge Road, was determined to provide low-rated potentially suitable habitat for loggerhead shrike.

Early successional fields are primarily located in the central portion of the project area, between Friendship and Perrine Roads. This area has limited access and is essentially undisturbed. Undisturbed early successional fields were dominated by mixed grasses including foxtail grasses (Setaria spp.), panic grasses (Panicum spp.), and orchard grass (Dactylis glomerata), as well as Canada thistle (Cirsium arvense), goldenrods (Solidago spp.), white clover (Trifolium repens) and yellow sweet clover (Melilotus officinalis). Other early successional fields are used for hay production and/or grazing. Some are located west of Friendship Road, east of McCormack Lake, and one is located directly north of the northern extension of McCormack Lake (Figure 1). Some of the early successional fields contained areas of emergent wetland vegetation, generally located near forest edges. These patches were dominated by various sedges (Carex spp.) and common rush (Juncus effusus).

Late successional fields are located southeast of the curve in Friendship Road (curve located approximately 1/3 mile west of the Friendship Road/East New Road intersection). These fields contained herbaceous species similar to those found in the early successional fields, but also contained woody species and seedlings or saplings. Dominant woody species included eastern red cedar (Juniperus virginiana), blackberry (Rubus allegheniensis), and multiflora rose (Rosa multiflora).

Wetland forest is located primarily in the area between the Friendship Road curve and Perrine Road. A large expanse of forested wetland is associated with the Devil's Brook in this area. Dominant canopy species in the forested wetland included sweet gum (Liquidambar styraciflua), red maple (Acer rubrum), swamp white oak (Quercus bicolor), green ash (Fraxinus pensylvanica), and pin oak (Quercus palustris).

Upland forest is located south of Friendship Road, east of the curve, in the area of the power line easement, and also between Route 1 and Ridge Road. Dominant canopy species in the upland forest south of Friendship Road include white oak (Quercus alba), American beech (Fagus grandifolia), red oak (Quercus rubra), and American elm (Ulmus americana). Various hickory (Carya spp.) species were present in both upland and wetland forests. The westernmost forested area (between Route 1 and Ridge Road) was dominated by eastern red cedar and crabapple (Malus sp.).

The majority of the agricultural land throughout the project area was planted in either corn or soybeans at the time of the field surveys. One field, located at the western end of the project area, at the intersection of Ridge Road and Schalk's Crossing Road, was planted in oats.

B. Habitat Evaluation for Species of Concern

The potential for suitable habitat and presence within the study area of each of the SOCs were evaluated. Habitat suitability was determined based on a comparison of descriptions of habitat reported in the literature to vegetative community characteristics observed in the field or deduced from review of aerial photographs. A rating index of potentially suitable habitat for each of the SOCs was developed. Habitat suitability was rated from no potential (0) to high potential (4).

The presence of potentially suitable habitat within the project area does not necessarily imply that a particular species will be present. However, in general, the higher the potential that the habitat is suitable, the higher the likelihood that the species is present. The presence of each of the SOCs within the study area was determined from

direct observation during field surveys and previous reports in the vicinity of the project area. The results of these evaluations for each SOC are summarized in Table 2 (Appendix A) and are discussed below.

Pied-billed grebe

The pied-billed grebe is a permanent New Jersey resident of well-vegetated lakes, ponds and marshes. Only the breeding population is endangered in New Jersey. They build floating nests of vegetative material and prefer to nest in areas that are not heavily vegetated. They eat fish, frogs and aquatic invertebrates (Ehrlich *et al.*, 1988). There is no potential habitat to support pied-billed grebe within the project area. There are two small impoundments of the Devil's Brook, located north and south of the dirt farm road (Turkey Island Road) within the central portion of the project area. Both ponded areas, however, are surrounded by dense forest cover. McCormack Lake and its surrounds provide more potentially suitable habitat; therefore, it is unlikely that pied-billed grebe would utilize the small impoundments within the project area.

Although it is not recorded in the NJ Natural Heritage Program database (1995), pied-billed grebe has been documented on McCormack Lake (Fishback, 1994). No pied-billed grebes were observed during field surveys. It was determined that pied-billed grebe are not present within the project area due to lack of suitable habitat.

Great blue heron

The great blue heron is a large bird of marshes, swamps, shores and tidal flats. Only the breeding population is threatened in New Jersey. Breeding habitat consists of freshwater or brackish marshes, swamps, rivers, lakes or mangroves, and is used by large colonies of the birds. They forage alone, however, at remote feeding sites. There are 10 - 15 great blue heron rookeries in New Jersey. There are no known rookeries in Middlesex County (Mr. Dave Jenkins, personal communications, 1995). Potentially suitable feeding habitat occurs within the project area on the Turkey Island property, within the Devil's Brook and the two small impoundments north and south of the dirt farm road.

The NJ Natural Heritage Program database (1995) does not record any sightings on or in the immediate vicinity of the site, or within the Hightstown or Jamesburg quadrangles. According to the Ecological Resources Inventory for the Turkey Island property, great blue herons do utilize habitat in and around McCormack Lake and the Devil's Brook (Fishback, 1994). However, this is not critical breeding habitat. A great blue heron was observed in mid-June, standing in the northern corner of an agricultural field located east of Perrine Road, north of the project alignment. Another (or possibly the same individual) was

observed flying over forested wetlands and agricultural fields within the project area during field investigations in July. It was concluded that there is some potentially suitable feeding habitat, but no potentially suitable nesting habitat within the project area.

American bittern

The American bittern is a bird of marshes, meadows and, occasionally, upland pastures (Pearson, 1936). Only the breeding population is threatened in New Jersey. They nest on the ground among reeds in marshes. The bittern has a habit of standing among the reeds with its head cocked straight up so that they easily blend with the environment and are difficult to observe. Habitat size requirements are variable, but American bitterns are more abundant in larger wetland complexes (NJDEP, 1993).

Although they can be found in swamps, it appears that potentially suitable habitat would be associated with the areas surrounding McCormack Lake. The wooded swamp habitat surrounding the Devil's Brook within the project area would not provide suitable habitat. There is no record of American bittern in the NJ Natural Heritage Program database (1995) for the Hightstown or Jamesburg quadrangles. American bittern was sighted by Fishback (1994) within wetland emergent and open water (McCormack Lake) habitat on the Turkey Island Corporation property.

No field surveys were conducted specifically for American bittern, since it was determined that no habitat exists within the project area.

Osprey

The osprey is mainly a coastal bird, but can occur inland near bodies of water that are well stocked with fish, the primary component of the osprey's diet (NJDEP, 1980). They nest on tall structures such as dead trees or man-made towers or poles, overlooking the water which is the source of their food supply. No standards for minimum size have been applied to establish the suitability of a water body for osprey foraging, but there must be a sufficient fish population. Timing, frequency of and distance from human disturbance is critical to nesting of ospreys. Adverse impacts have been recorded for activities from 0.12 to 0.9 miles from the nesting site.

Although there are no records of osprey within the Jamesburg and Hightstown quadrangles of the NJ Natural Heritage Program database (1995), Fishback (1994) reports occurrence of osprey at McCormack Lake, south of the project area. The specific location and activity (nesting, resting or feeding) was not reported. While there might be a sufficient fish population within McCormack Lake to support osprey, there is no suitable habitat within the project area for this raptor.

No field surveys were conducted specifically for osprey, since it was determined that no habitat exists within the project area.

Northern harrier

The northern harrier is also known as "marsh hawk", which reflects its habitat requirements. In New Jersey, they breed and nest in wet meadows and marshes. Outside of the breeding season, they roost communally on the ground. They feed on anything from insects to reptiles and small mammals (especially voles), hunting over any kind of open land including short-grass or plowed fields and freshwater marshes (Terwilliger, 1991). Only the breeding population is listed as endangered in New Jersey. Findings suggest that they are largely extirpated as an inland breeder. The northern harrier has been documented as breeding only in salt marshes (Terwilliger, 1991).

Wet meadow habitat is located in the central portion of the project area, bordering forested wetlands. The two wet meadow areas, located on either side of the dirt farm road, and east of the Devil's Brook, are small, no more than a few acres, and close to forested habitat. The wet meadows are also occasionally grazed by cattle or mowed. It is unlikely that northern harriers would utilize these areas. In addition, there are no recorded sightings of the species in the Jamesburg or Hightstown USGS quadrangles (NJNHP, 1995). Fishback (1994) reports occasional use of upland grassland within the Turkey Island Corporation property by this species, although he does not report the time of year, exact location or activities of the observed bird(s). Although the location is not specifically given, the largest area of upland grassland within the ERI study area coincides with the large, contiguous, upland early successional field area just west of Friendship Road within the study area.

No northern harriers were observed during field investigations. There are no salt marshes within the study area; therefore, it was determined that there is no breeding habitat, although there is low potentially suitable feeding habitat. Northern harrier, if present within the area, might occasionally utilize fields within the study area for foraging, particularly during the winter.

Cooper's hawk

Cooper's hawks prefer riparian deciduous, or sometimes coniferous forest for breeding and hunting. Utilizing open woodlands and wood margins, they usually nest 20 to 60 feet above the ground and are considered very secretive birds (Pearson, 1936; Craighead, 1956). Like many raptors, the Cooper's hawk eats small mammals, passerines, reptiles and amphibians. Cooper's hawk has been considered a transient species in New Jersey, passing through only during migration

(Leck, 1975). However, according to Ms. Sherry Meyer and Mr. Dave Jenkins of the NJDEP Division of Fish, Game and Wildlife (personal communications, 1995), Cooper's hawks are becoming more common nesting and year-round residents in New Jersey.

The proposed Route 92 alignment passes through riparian deciduous forest within the Turkey Island Corporation property, the edges of which could provide suitable habitat for the Cooper's hawk. Fishback (1994) reports sighting of Cooper's hawk within upland forest on the Turkey Island Corp. property, but does not specify whether this was north or south of McCormack Lake, and does not report the time of year. There are no records of Cooper's hawk in the Natural Heritage Program database (1995) for the Jamesburg or Hightstown quadrangles.

Though no Cooper's hawks were positively identified during field investigations, an unidentified hawk, approximating the silhouette of a Cooper's or sharp-shinned hawk was observed soaring over deciduous forest northeast of McCormack Lake within the project area in June, 1995. The bird was not sufficiently close to be able to identify distinguishing characteristics. However, it was determined that it was not a red-tailed hawk. In addition, an unidentified hawk call was heard within the same area of the site, which may have been a Cooper's hawk.

The area of the siting contains potential habitat for Cooper's hawk. Although no Cooper's hawks were definitively sighted during our field investigation, it is possible that they utilize forest habitat within the immediate vicinity of the project area for hunting and/or breeding habitat.

Red-shouldered hawk

The red-shouldered hawk breeds in moist to swampy woodlands, generally nesting in the first main crotch of a hardwood. They are generally found in pairs, as they mate for the entire year and possibly for life. They eat small mammals, amphibians, reptiles, insects and some small birds (Craighead, 1956; NJDEP, 1980; Pearson, 1936). Red-shouldered hawk is a transient, and an uncommon breeder in New Jersey (Leck, 1975). However, they can be found in New Jersey year-round (Valent, 1989).

There is low potentially suitable habitat (forested wetland) within the central portion of the project area, northwest of McCormack Lake. No red-shouldered hawks were reported by Fishback (1994) during his extensive studies in the area, and there is no record of this species in the Natural Heritage Program database (1995) for the Hightstown and Jamesburg quadrangles.

No evidence of red-shouldered hawk was noted during ASGECI field investigations. Although there is low potentially suitable habitat within and around the project area, the species is not likely to be present in the project area since it is generally a transient species, and has never been recorded as being sighted within either of the USGS quadrangles that encompass the project area.

Peregrine falcon

Although the peregrine falcon has historically been one of the most widely distributed species in the world, being present on every continent except Antarctica, it is rare in the northeast region, and is Federally listed as endangered. Peregrine falcons nest on cliffs, talus slopes, hollows of trees, 50 to 90 feet up in the tops of trees, and in nests of other large birds. They do not build nests themselves, but may scrape out hollows on cliffs. They may use the same nest site for many years (Hickey and Anderson, 1969). The peregrine is generally a cosmopolitan species (Terwilliger, 1991), perhaps due to its association with one of its favorite prey species, the rock dove. Since their reintroduction in New Jersey and New York, they have often nested on man-made structures in urban areas. As of 1995, 15 pairs of peregrines are known to breed in New Jersey and all nest only on artificial structures such as bridges, buildings and constructed hack towers (Ms. Kathy Clark, personal communications, 1995). Nest sites are usually selected by early March, and eggs are laid by late March or early April in this area (Dr. Tom Cade, personal communication, 1995). Peregrines may lay a second clutch of eggs if the first set is destroyed early in incubation (Beebe, 1967). The young are fledged within 35 to 42 days of hatching (Brown and Amadon, 1968). Fledging ends toward the end of June in New Jersey (Dr. Cade).

No suitable habitat for the peregrine falcon is present within or in the vicinity of the project area. In addition, no peregrines have been reported to the NJ Natural Heritage Program (1995) within the Jamesburg or Hightstown quadrangles, or in the Environmental Resources Inventory of the Turkey Island Corporation property (Fishback, 1994).

No field surveys were conducted specifically for peregrine falcon, since it was determined that no habitat exists within the project area.

Upland sandpiper

Upland sandpipers prefer large, open grasslands with a thin, uniform cover or areas of dense grass interspersed with less dense areas (Carter, 1992). They nest in grass ranging from 6 to 16 inches in height, but feed in grassy fields with low vegetation height. Plowed fields and/or short-grass, heavily grazed pastures or sod farms, as well as airports

are also used, especially in migration (Terwilliger, 1991). Upland sandpipers will avoid forests and successional fields, even in flight (Plage, 1983).

According to Jones and Vickery (1995), upland sandpipers need breeding area of at least 100 acres and preferably 400 acres. Some studies suggests that they require a minimum area of contiguous habitat of at least 10 hectares (24.1 acres) while other studies indicate minimum requirements of 30 hectares (72.3 acres) (Askins, 1993). There is a positive correlation between the area of contiguous grassland and the frequency of occurrence of the upland sandpiper. These and other grassland birds are now reduced to breeding primarily at airports, a few remaining large hay fields and pastures, and some meadows in conservation areas. Extensive row cropping and early crop-cutting threaten these birds.

The upland sandpiper generally nests in early May, constructing four-inch cups in bunches of grass or in a slight hollow scooped in the ground and lined with fine grasses. Family groups appear to remain together until post-breeding migration. Post-breeding upland sandpipers may linger in the breeding locales, or may join others at airfields or other locations (Terwilliger, 1991). Potentially suitable habitat for this species occurs only within the central portion of the study area. One field is located immediately north of McCormack Lake. This field, however, at approximately 25 acres, is smaller than the minimum requirements suggested by Jones and Vickery (1995) and Askins (1993). The largest contiguous stretch of fields is located west of Friendship Road, northeast of McCormack Lake. This stretch consists of several fields, separated only by occasional fencing, and continues beyond the project area. It totals approximately 90 acres, which according to Jones and Vickery (1995), is not quite large enough to be optimal habitat. However, Fishback (1994) documented use of upland grassland habitat on the Turkey Island Corporation property by upland sandpiper. Although the location is not specifically given, the largest area of upland grassland within the ERI study area coincides with the larger field described above. A record of upland sandpiper (1976) is also found in the Natural Heritage Program Database, Hightstown quadrangle.

No upland sandpipers were sighted during field surveys of potentially suitable habitat. However, there is potential for this species to use the expanse of fields adjacent to and south of the alignment on the Turkey Island Corporation property.

Barred owl

The barred owl inhabits wetland and sometimes upland deciduous forests. They are seldom found far from wet habitats. Woodlands bordering lakes, streams, wet meadows, swamps or marshes are particularly attractive to this species. The vocal barred owl resides in New Jersey year-round (Valent, 1989).

The barred owl generally nests in tree cavities, but will also utilize abandoned crow, hawk or squirrel nests (Terres, 1980). Their diet consists mainly of small rodents, but they will also prey upon other small mammals, birds, reptiles and invertebrates. Destruction of wetlands and woodlands is the main threat to this species. Barred owls have been documented to exhibit a strong avoidance for human activity, major roadways and suburban housing developments (NJDEP, 1993).

Potentially suitable habitat for barred owl is present within the central forested area of the project area, surrounding the Devil's Brook and Amtrak lines, and within upland deciduous forest south and east of Friendship Road, near the PSE&G right-of-way. Barred owl has been documented on the Natural Heritage Program database (1995), in the wooded wetlands in the immediate vicinity of the project area. Conversations with a local farmer indicated that he had heard barred owl within the wooded wetlands in the project area on several evenings in the fall and winter. In addition, barred owl use has been documented in the forested wetlands on the Turkey Island Corporation property, which may include a portion of the project area (Fishback, 1994). According to Mr. Larry Torok of the NJDEP Division of Fish, Game and Wildlife, the habitat within the project area does not appear to be ideal for barred owl (personal communication, October 1995).

A survey for barred owls using a taped vocalization was performed on a very calm night in early June, which would have been an optimal time for observing this species. No barred owls were seen or heard in any of the areas determined by ASGECI to provide suitable habitat. It is possible that habitat within the project area is utilized by barred owl. However, it was expected that vocalizations within the forested areas would produce responses if barred owls were present within two miles. However, additional nights of observation may have yielded different results.

It was determined that barred owl may be present within the project area. Potentially suitable habitat is present.

Red-headed woodpecker

The red-headed woodpecker lives mostly in open deciduous woods or prairie country (Terres, 1980). Parklike settings, open fields or pastures with open groves of large trees are

preferred, although they will frequently dwell in hearts of small cities and nest in utility poles along streets in rural areas. They will also inhabit areas of mature forest with an open understory, or forest edges near an open area (Vodak, 1992). Nest cavities are generally located in dead trees 23 to 40 feet above the ground.

The red-headed woodpecker catches flying insects on the wing and seldom drills into trees in typical woodpecker fashion. They will also forage on the ground and in shrubs, eating all kinds of insects, but also fruits, vegetable matter, and young birds or mice (Pearson, 1936).

There is minimal potentially suitable habitat for the red-headed woodpecker within the project area. Only two small areas of forest edge habitat, within the central portion of the project area could potentially support this species. No documentation of this species has been recorded in either the Fishback study (1994) or within the Hightstown or Jamesburg quadrangles in the Natural Heritage Program database (1995).

The area of minimal potentially suitable habitat was surveyed and no red-headed woodpeckers were seen or heard (downy and hairy woodpeckers were heard in adjacent forested areas). It is unlikely that this species exists within the project area due to the lack of sightings and minimal potential for suitable habitat.

Cliff swallow

These birds are colonial nesters that formerly nested on cliffs. Only the breeding population is threatened in New Jersey. They now nest almost exclusively on or under barn eaves (NJDEP, 1980). Insects are their primary diet. Foraging occurs over open lands, particularly agricultural fields. They summer in open country habitats near running water (Terwilliger, 1991). No information was found regarding their success in competition with other species of swallows (i.e., tree swallows and barn swallows).

There is one barn located within the project area. Some barns are located to the north and south. These are the only locations of potential habitat for the cliff swallow. However, these locations contained very high populations of barn and tree swallows.

No sightings of cliff swallow are reported in the Fishback study (1994) or in the Natural Heritage Program database (1995) for the USGS quadrangles in which the project area occurs. Field surveys performed by ASGECI produced no evidence of this species within the project area. Although there is low potentially suitable habitat within the project area, it is used extensively by other swallows. It is not likely that this species is present within the project area.

Loggerhead shrike

The loggerhead shrike is a bird of hedgerow habitats. Its interesting characteristic of impaling its prey has earned it the nickname "butcher bird". Because of this habit, the bird requires habitat with thorny or sharp vegetation (including red cedars) or barbed fencerows. Red cedars and hawthorns are frequently used for nesting (Terwilliger, 1991). Invertebrates are the chief source of food, but the loggerhead may also take small mammals or other birds. When forced to move to forested areas due to habitat or prey loss, shrikes can fall prey to raptors.

Several fencerows and hedgerows of multiflora rose are present within the central portion of the project area. In addition, a red cedar stand is present within the project area, at the western end, near US Route 1.

There is no documentation of loggerhead shrike within the USGS quadrangles in which the project area occurs (NJNHP, 1995). No loggerhead shrikes were documented by Fishback (1994) during surveys of the Turkey Island Corporation property. Evidence of the existence of loggerhead shrike was not observed within suitable habitat determined to be of low potential for this species. It is unlikely that this species is present within the project area.

Vesper sparrow

Vesper sparrows prefer fields that are adjacent to or bisected by a hedgerow with shrubs (Best and Rodenhouse, 1984). They generally perch in the hedgerow and nest in sparsely vegetated areas in adjacent fields. They sing throughout the day in the nesting season. Vesper sparrows forage over the ground, eating insects, weed seeds and waste grain (Terres, 1980). They nest on the ground under dead weed stems in small depressions, occasionally in alfalfa or previous year corn fields. Several studies (Askins, 1993; Jones and Vickery, 1995; Vickery, Hunter and Melvin, 1994) have indicated that incidence of this species reached 50% at 50 acres of suitable habitat and that the incidence was strongly correlated with the size of the grassland. The 50% incidence is thought to provide a reasonable estimate of a species' minimum area requirement (Vickery *et al.*, 1994).

Low potentially suitable habitat for the vesper sparrow is present in the central portion of the study area, west of Friendship Road, where contiguous fields continue south of the project area. The total area of these fields is approximately 90 acres. However, these fields may be too thickly vegetated to support any breeding pairs. Agricultural fields exceeding 50 acres within the study area might provide some habitat if and when they are left fallow. However, these would vary yearly. Nearly all agricultural fields within the study area were planted in 1995.

There is no documentation of vesper sparrow within the USGS quadrangles which include the project area (NJNHP, 1995). Fishback (1994) did not observe this species during surveys of the Turkey Island Corporation property. No vesper sparrows were observed within low potentially suitable habitat for this species by ASGECI. It is unlikely that this species is present within the study area.

Savannah sparrow

As a breeding bird in New Jersey, the savannah sparrow is restricted to short grass fields or relatively dry, short-grass salt marshes. However, habitat size is not as restricting as it is with the vesper and Henslow's sparrow. Approximately 25 acres seems to be the minimum habitat size (Askins, 1993). Like most of the grassland passerines, territory size is only 1 to 3 hectares (approximately 2 1/2 to 7 1/2 acres). They prefer areas of relatively dense, continuous grass cover with a relatively thick layer of dead grass, similar to typical eastern meadowlark habitat. However, they have also been known to use agricultural fields.

Savannah sparrows nest in excavated or natural ground depressions lined with fine vegetation, and generally well concealed (Ehrlich *et al.*, 1988). They roost in small compact groups on the ground. Their diet mainly consists of spiders and grass seeds.

The project area contains some potentially suitable habitat for savannah sparrow, particularly the mowed grassy hay fields in the central portion of the project area, on the Turkey Island Corporation property. The field north of McCormack Lake is approximately 25 acres. Contiguous fields northeast of the lake, west of Friendship Road, total approximately 90 acres. Savannah sparrow has been documented on the Turkey Island property within wetland emergent, upland grassland and upland agricultural habitats (Fishback, 1994). This species is recorded as being on or within the immediate vicinity of the site in the Natural Heritage Program database (1995).

No savannah sparrows were observed during ASGECI field surveys within the study area. Although the field investigations began near the end of the nesting/breeding season, they still took place during a time which should have yielded sightings if this species were present. However, this species has been reported previously in the vicinity and potentially suitable habitat does exist.

Grasshopper sparrow

The grasshopper sparrow is an inconspicuous bird traditionally restricted in the forested northeast to extensive natural clearings and sparsely wooded areas.

Clearing of land for agriculture permitted this species to spread as a result of increases in availability of suitable nesting habitat. However, as a result of loss of agricultural land to development, mowing during the breeding/fledging period, and with the decline in the agricultural base of the northeast resulting in the regeneration of farmland to a shrub or forested state, the status of this species, as well as other grassland birds in New Jersey (e.g., vesper and savannah sparrows, upland sandpiper, etc.), has declined in recent years (NJDEP, 1980 & 1987).

Smith (1963) describes grasshopper sparrow habitat as consisting primarily of cultivated grasslands, particularly those containing orchard grass (Dactylis glomerata), alfalfa (Medicago sativa), red clover (Trifolium pratense), and bush clover (Lespedeza spp.). Habitat suitability for this species declines dramatically as fertility of grassland increases, resulting in increases in vegetation density or, in successional old field communities, in a marked increase in woody vegetation cover (i.e., shrubs). Old field communities inhabited by the grasshopper sparrow may also include poverty grass (Danthana spicata), bramble (Rubus spp.), and beardgrass (Andropogon spp.), but the birds leave as the fields fill with shrubs (Smith, 1963).

Vickery (1994) states that grasshopper sparrows prefer areas of at least 200 acres. Incidence increases with grassland size, and nests have been found with significantly greater frequency in the grassland interior, farther from the edge (Askins, 1993). The species breeds in open areas that are maintained at a height of approximately 10 to 16 inches and are composed mainly of grasses. It is most common in areas of bunch grasses with areas of bare ground (at least 24%), rather than areas of continuous grass cover. Grasshopper sparrows have been reported to abandon fields when shrub cover exceeds 35% (Johnston and Odum, 1956), however some low shrubs are important for singing perches (Vickery, 1990).

There is minimal potentially suitable grasshopper sparrow habitat within the study area. Hay fields in the central portion, on the Turkey Island property, west of Friendship Road are not nearly as large as research indicates as the preferred size for habitation by this species. The largest contiguous field area is 90 acres. However, this does not preclude the grasshopper sparrow from utilizing smaller fields. Smith (1962) documented up to six breeding pairs within a 30-acre area of otherwise suitable habitat. Fields in the study area contain nearly continuous cover, with little bare area. The high fertility of these fields indicates that usage by grasshopper sparrow, if present,

would be low. Shrub cover in the field east of Friendship Road, and in fields east of Route 130, appears to exceed 35%.

There is no documentation of grasshopper sparrow within the USGS quadrangles which include the project area (NJNHP, 1995). No grasshopper sparrows were documented by Fishback (1994) during surveys of the Turkey Island Corporation property. Grasshopper sparrows were not observed by ASGECI within minimal potentially suitable for this species. It was determined that this species may not be present within the study area, since there is minimal potentially suitable habitat and there has been no documented occurrence.

Henslow's sparrow

Henslow's sparrow is a secretive bird of low wet meadows and abandoned, early successional, agricultural fields. Much of its time is spent on the ground among tall grass and brush (Terwilliger, 1991). This sparrow prefers low damp places, but also frequents dry upland fields. Ground cover is usually dense and one to two feet high (Terres, 1980). When breeding, male Henslow's sparrows sing day and night, usually from a bush or tall weed, but occasionally concealed in the grass. They are reported to sing incessantly in the rain.

The Henslow's sparrow forages on the ground, eating insects and seeds. They live in loose colonies, nesting on the ground. Terres (1980) refers to a territory size of one to two acres. The Askins (1993) study found that Henslow's sparrow was absent from prairies smaller than approximately 25 acres. Unlike the grasshopper sparrow, the Henslow's sparrow does not inhabit burned or mowed fields, preferring dense litter to bare spaces. On the other hand, too much brush will drive them from a site. Therefore, this species must constantly shift to new patches of habitat (Askins, 1993).

Minimal potentially suitable habitat for Henslow's sparrow was found within the study area. Most of the fields within the study area are mowed or grazed on a rotational basis. Fields that are not mowed are smaller than 25 acres. Therefore, there is limited potential for the presence of Henslow's sparrow.

There is no documentation of Henslow's sparrow within the USGS quadrangles that include the project area (NJNHP, 1995). None were documented by Fishback (1994) during surveys of the Turkey Island Corporation property. No Henslow's sparrows were observed during field investigations by ASGECI. It is unlikely that this species is present within the project area. There is only minimal potentially suitable habitat present.

Bobolink

Bobolinks inhabit fields with dense grasses or forbs, especially hay fields. They nest on the ground in a natural or scraped depression (Ehrlich *et al.*, 1988). Bollinger and Gavin (1992) found that bobolinks were more abundant in hay fields than in any other open habitat. They concluded that they are most abundant in fields with relatively sparse vegetation dominated by grass. In addition, a dense mat of dead vegetation, typical of older hay fields, is preferred (Askins, 1993). While large areas of habitat do not appear to be required by this species, incidence of bobolinks does increase exponentially with increases in habitat area from 2.5 to 75 acres.

There is potentially suitable habitat for the bobolink within the hay fields and pasture in the central portion of the project area (Turkey Island Corporation property) and in successional fields east of Route 130 and north of Route 32. Additional potential habitat may occur south of the project area. Fishback (1994) reports occurrence of bobolink within wetland emergent and upland grassland habitat on the Turkey Island Corporation property, but does not indicate the location. However, the largest area of upland grassland within the ERI study area coincides with the approximately 90 acres of upland field within this project's study area. The Natural Heritage Program database (1995) contains a sighting of bobolink within the immediate vicinity of the project area.

Although no bobolinks were sighted during field investigations by ASGECI, potentially suitable habitat does exist within and south of the project area and the species has been reported in the vicinity by others.

Wood turtle

Wood turtles require both aquatic and terrestrial habitat (NJDEP, 1993). They tend to be aquatic from approximately mid-November to mid-March, terrestrial from mid-May to mid-September, and in transition the remainder of the year. Streams and rivers are used primarily for breeding and hibernating. They prefer slow meandering streams with sandy bottoms and shoals for breeding in the spring or fall. In the winter, they hibernate on the bottom or within the banks of streams or rivers. Wood turtles will nest in any number of habitats, including agricultural fields (Zappalorti *et al.*, 1984).

The Devil's Brook and its environs appears to provide low potentially suitable habitat for this species. During field surveys of the project area in the summer, many portions of the Devil's Brook were dry, or nearly so. However, because New Jersey was experiencing a drought during the summer of 1995, it is not known if the brook generally carries enough water to support wood turtle activities. Because most of

the Devil's Brook has been channelized within the project area, it does not provide many undercut banks that the turtles hibernate under. Portions of the stream outside of the project area may, however, have suitable characteristics. Wood turtles might use the fields in the project area during the summer. Mr. Larry Torok of NJDEP, Division of Fish Game and Wildlife, who has made limited field surveys of the forested habitat surrounding the brook, stated that the habitat is not optimum for wood turtles (personal communication, October 1995).

The NJ Natural Heritage Program database (1995) contains records of wood turtles in both the Hightstown and Jamesburg quadrangles. Fishback (1994), however, does not report sighting of wood turtles within the Turkey Island Corporation property.

No wood turtles were found during field surveys of the forested wetlands associated with the Devil's Brook. The majority of the brook within the project area is channelized and therefore, not likely to support wood turtles. Field surveys, however, were limited, and wood turtles can be difficult to find, even in optimal habitat. Therefore, it is possible that wood turtles are present within the project area, but not likely, due to the low potential for the habitat to be suitable.

Bog turtle

The bog turtle is most abundant in Monmouth, Warren, Sussex, Morris, Passaic, and Union counties. It is considered to be imperiled because of rarity (6 - 20 occurrences in the State). Much of its historical habitat has been lost due to destruction of wetlands (Zappalorti, 1990).

Bog turtles hibernate through the winter in burrows of muskrats and other small mammals or in burrows they have excavated for themselves (Ernst *et al.*, 1989). These small turtles leave their hibernacula in April through May, and return in the late summer. They are occasionally seen in the fall months (Terwilliger, 1991). Summer hibernation (aestivation) may occur in hot weather, usually in July or August (Bury, 1979). Bog turtles can mate from late April through July (Gourley, 1979; Ernst *et al.*, 1989). They may lay two clutches in one year.

Preferred habitat includes relatively open portions of sphagnum bogs, swamps, or marshy meadows with slow-moving, spring fed streams or spring seeps with soft bottoms (Zappalorti, 1980; Bury, 1979; Chase, 1989). Pure, unpolluted water is required. The nest and hibernacula sites include grass/forb areas and areas with emergent aquatic vegetation. Common flora in bog turtle habitat includes alder (Alnus sp.), low grasses and sedges, skunk cabbage (Symplocarpus foetidus), cattail (Typha spp.),

jewelweed (Impatiens capensis), and smartweed (Polygonum sp.)(Terwilliger, 1991; Zappalorti, 1980; Chase, 1989). Bog turtles disappear when boggy areas with muddy substrate and associated flora succeed to hardwood swamps. Zappalorti (1980) suggests that open canopy is essential to bog turtle habitat.

The NJ Natural Heritage Program database (1995) contains no records of bog turtle in either the Hightstown or Jamesburg quadrangles. Fishback (1994) does not report sighting of bog turtle within the Turkey Island Corporation property.

No potentially suitable habitat exists within the project area. Swamp habitat with sedge tussocks and skunk cabbage does exist in association with the Devil's Brook in the central portion. However, this area is flowed only intermittently and has a closed canopy.

No bog turtles were found during field surveys. Field surveys, however, were limited, and did not occur during optimum search times. Bog turtles are small and difficult to find. It is unlikely that bog turtles are present within the project area, since there is no potentially suitable habitat.

Triangle floater

The triangle floater is a rare mussel in New Jersey. It prefers small streams where it becomes locally very abundant, going far up towards the headwaters (Clark, 1981). It is found chiefly where steady water flow prevails, and seems to avoid rough water and riffles. While this mussel tends not to prefer slackwater, it has occasionally been found in ponds and canals. It lives mostly in a mixture of coarser or finer gravel with sand and mud. However, it has also been documented in eddies with slow current embedded in the mud deposited between larger stones. Clark (1981) observed that it is also abundant in outlet streams just below lakes.

Potentially suitable habitat in the project area includes the channelized portion of the Devil's Brook parallel to the railroad. This portion of the brook was diverted to accommodate the Amtrak Railroad line. This portion of the Devil's Brook is canal-like; it consists of a very straight channel with a sandy, gravelly bottom. It is very clear and generally void of stones, vegetation or debris. This brook could contain habitat for the triangle floater, although more suitable habitat would potentially exist south of the project area, within the Shallow Brook outlet of McCormack Lake.

The NJ Natural Heritage Program database (1995) contains a documented occurrence within the Hightstown USGS topographic quadrangle, as recently as September 1994 (location not

described). No geographical records for the species, however, were listed within the Millstone River drainage basin by Clark (1981), and the Ecological Resources Inventory of the Turkey Island Corporation property (Fishback, 1994) does not report sighting of this species.

No mussels or mussel shells of any kind were observed within the project area. Unidentified bivalve shells and shell pieces were observed by ASGECI field personnel within the northern limits of McCormack Lake, south of the project area.

It is unlikely that this species is present in the project area. Only minimal potentially suitable habitat is located within the project area.

Brook floater

The brook floater is a mussel, usually found in rapids or riffles on rock and gravel substrates and also on sandy shoals (Clark, 1981). It is found in small rivers and creeks.

There is no potentially suitable habitat within the project area for the brook floater. There may be suitable habitat for this species in the Millstone River or the Shallow Brook, south of the project area. This species, however, has not been recorded within the Millstone River drainage basin (Clark, 1981) nor within the Jamesburg or Hightstown USGS quadrangles (NJNHP, 1995). The Ecological Resources Inventory of the Turkey Island Corporation property (Fishback, 1994) does not report a sighting of this species.

No mussels or mussel shells of any kind were observed within the project area. There is little potential for this species to exist within the project area, as there is no potentially suitable habitat.

Yellow lampmussel

This mussel species is very adaptable to artificial lacustrine habitats, and favors stable sand and muddy sands in larger bodies of water, apparently with little regard for waves and current (Fuller, 1980). Potentially suitable habitat for yellow lampmussel appears to be absent from the project area. McCormack Lake, south of the project area, could provide potential habitat for this species.

There is no documented occurrence of this species within the USGS quadrangles that contain the project area (NJNHP, 1995), and it was not reported in the Ecological Resources Inventory of the Turkey Island Corporation property (Fishback, 1994). The species has not been sighted and was determined not to be present within the project area due to lack of potentially suitable habitat.

C. Other Wildlife Sightings

Several mammals, reptiles, amphibians, and 45 species of birds were observed throughout the study area (Table 3; Appendix A). The species observed are generally common to rural, developed and agricultural areas. Additional species common to agricultural and developed areas, although not observed, would also be expected to inhabit the area.

The avian community, while varied, consists primarily of common songbirds. These birds tended to be present primarily along hedgerows and wooded edges of early successional and agricultural fields. Forest interiors and central areas of agricultural fields were less active with avian species. In general, birds were not prevalent in areas in the immediate vicinity of human disturbances. Swallows (tree and barn), however, were observed on overhead wires, and in very close proximity to houses and barns. These species are somewhat dependant on this type of human development. It is interesting to note that most birds were found to be associated with upland habitat. Raptors (e.g., American kestrel and red-tailed hawk) were mainly associated with forest edges of agricultural fields, presumably so they can overlook the fields for foraging.

Mammals were found in nearly all habitat types. All mammals observed are common to agricultural/rural areas. White-tailed deer were observed mainly within forested areas, while smaller mammals were observed in fields and close to hedgerows, and along the wooded stream corridors. In mid-June, a fox was observed playing in the early successional field located north of Lake McCormack, in the central portion of the study area. According to the landowner, a den is located in the vicinity. Reptiles and amphibians were observed only in the forested wetlands or within the brook itself.

The greatest diversity of species was observed in upland fields (including agricultural), but was concentrated at hedgerows and forested edges. This may be partially accounted for by the fact that this habitat is the most abundant throughout the alignment. However, it is also good habitat because it provides food, cover and nesting habitat for many avian species, which were the most abundant group of wildlife observed here. Small mammals such as rabbits and hedgehogs also thrive in this habitat.

Forested wetland habitat also yielded sightings of diverse species, primarily reptiles and amphibians but also mammals. Wetland emergent areas and upland forested areas were not prevalent within the study area, and did not yield a great diversity or concentration of wildlife sightings.

Because this investigation was performed primarily during the summer months, migratory species that potentially utilize the project area were not identified. Additionally, many species that could use the project area during the summer months were also not observed. Species that are primarily nocturnal, cautious or inconspicuous may be present. Examples of species not observed, but expected to be present in the project area, include skunks, bats, small frogs and migratory warblers.

IV. ANALYSIS OF POTENTIAL PROJECT IMPACTS TO WILDLIFE

The potential for adverse impacts to wildlife, and endangered and threatened species in particular, as a result of construction of the wetland minimization alignment for Route 92 was evaluated. The evaluation was based on the probability that the SOCs utilize habitat within the proposed ROW of the alignment, the types of wildlife found in the project area, and the relative value of the wildlife habitat.

Wildlife within the project area would be directly impacted by the loss of some habitat. Fragmentation of fields and forests may also impact habitat suitability for some species. The development of the highway will increase human activity in the project area. This may impact wildlife within the project area and wildlife that resides outside of the project area, but is sensitive to human disturbance. Impacts to water quality could impact reptiles and amphibians, as well as other wildlife that utilizes the water supply in or around the project area.

The development of proposed Route 92 will cause the direct loss of areas of several habitat types within the alignment. The greatest acreage of habitat type lost will be agricultural land. Although 40 species, nearly all avian, were observed utilizing agricultural land throughout the alignment, the majority of these species were observed to be concentrated within hedgerows, or at the perimeter of forested areas. Although some of the hedgerow habitat will be lost, the Wetlands Minimization Alignment was designed to avoid as much of the forested area as possible, and is concentrated in the open areas of the agricultural fields throughout the majority of the alignment. These planted areas were observed to support fewer species and a lower concentration of wildlife in general. Forest/field edges will generally be preserved. Therefore, concentration of the alignment through agricultural lands minimizes the habitat loss.

Early successional fields provided habitat for the greatest diversity of species (primarily avian) in relation to the amount of habitat within the project area. The proposed

alignment generally runs along the edges of this habitat type, although one field at the intersection of Route 32 and Route 130 and another located north of the northern extension of Lake McCormack, will be bisected (see Figure 1). The planned location of the alignment primarily along the edges of early successional field habitat will minimize the impact of habitat loss to species in this community.

Direct loss of forested habitat will primarily occur within the central and western areas of the alignment. The alignment avoids forested areas as much as possible; approximately 32 acres of forest will be impacted between Perrine Road and Route 130. The species most likely to be affected by the loss of this habitat are the woodland birds. Habitat for some species, such as the white-tailed deer, may be enhanced by the creation of additional edge habitat. Since much of surrounding lands to the north and south are forested, direct impacts to wildlife from the loss of this amount of forest should be low. The same species utilizing forested land within the project area would be expected to also be present in the extensive forested areas outside of the project area.

In addition to the direct impacts of highway construction, there may be impacts on wildlife associated with the fragmentation of habitats. The most significant area affected by forest fragmentation is in the area between Friendship Road and the railroad tracks. The alignment bisects forested wetlands and upland early successional field (grassland) habitat in this area. The alignment generally follows an existing dirt road in the eastern portion of the Turkey Island Corporation property, which forms the northern boundary of the largest contiguous area of early successional field (approximately 90 acres) within the study area. The alignment then traverses two forested wetland areas and the northern half of an upland early successional field, north of McCormack Lake. With the exception of savannah sparrow and bobolink, the field, at approximately 25 acres, is probably not large enough to support significant populations of endangered or threatened grassland birds; but it was observed to support a large population of eastern meadowlarks. Fragmentation of this field may decrease the suitability of the upland field habitat for some species, such as eastern meadowlark and savannah sparrow.

The primary forested areas that the alignment bisects are "fingers" of a larger forested area located to the north of the project area. The eastern finger abuts the eastern portion of the northern extension of McCormack Lake to the west, and early successional fields to the east. This extension may provide a forested corridor for some wildlife, particularly mammals (e.g., deer, raccoon), to travel from the northern forest to the lake and fields. Fragmenting

this extension from the northern forest will make it difficult for these species to access the lake and fields. Some avian species, such as barred owl, although physically able to continue to use the corridor, may avoid accessing the fields and lake due to the presence of the highway. Fragmentation of the western "finger" will reduce the suitability of the southern fragment of this forest for species that utilize the forest interiors. Fragmentation of forest in this portion of the project area can not be avoided.

Non-avian wildlife will still be able to use the corridor provided along the railroad since the highway will be bridged over the tracks. In addition, box culverts are proposed where the highway crosses the Devil's Brook. These culverts should be designed to permit passage for fish and many reptiles and amphibians.

A small area of eastern red cedar-dominated forest will also be fragmented by the proposed alignment. This area, however, is located between US Route 1 and Ridge Road. This area does not support a large number or diversity of wildlife. Wildlife utilizing this habitat would be species that do not require large forested areas and are adapted to living near a highway. Two peninsulas of forest located north of Friendship Road just west of Route 130 will also be fragmented from contiguous forest by the highway. The value of these areas as wildlife corridors is low since the peninsulas are narrow and are disconnected from the forest south of Friendship Road by the existing roadway. Therefore, impacts in these areas due to fragmentation are expected to be minimal.

Amphibians, reptiles and aquatic species are susceptible to changes in water quality that could result from stormwater runoff from the highway. However, water quality of the streams should not be impacted due to proposed pre-treatment of stormwater discharge through the use of detention basins and grassed swales. Stormwater management practices will be in accordance with the standards of the Delaware and Raritan Canal Commission. The addition of detention basins may attract species such as Canada geese.

The impacts of human activity (e.g., increased noise, human presence) on wildlife will vary depending on the species. Due to the limited season and frequency of the field surveys conducted during this investigation, all species that utilize the project area were not observed. This includes species that are primarily nocturnal (bats, skunks), migratory (warblers, geese), or particularly cautious or inconspicuous (some frogs, rodents, etc.). However, most of the species observed within the project area are common to disturbed areas (see Table 3) and can be assumed to be indicative of the general wildlife population in the area.

These species continue to thrive amidst human development. Therefore, the impact of human activity within the project area, on species known to inhabit the project area, is anticipated to be minimal. However, some species that may be present in the immediate vicinity of the project area (e.g., osprey, barred owl) are known to strongly avoid human activity, including highways. If these species are present in the area, they will be adversely impacted by the construction of the proposed highway. Migratory species that are sensitive to human activity may also avoid the area once the highway is constructed.

Specific impacts to the SOCs that may be present in the project area were evaluated. The species with the potential to be impacted by the project area are osprey, barred owl, Cooper's hawk, bobolink, savannah sparrow, and wood turtle (Table 4). Since great blue heron and northern harrier are most likely to use habitats within the project area for foraging only, this is little potential to impact these species. Significant areas for foraging will remain unaffected by the project.

Timing, frequency of, and distance from disturbance is critical to nesting of osprey. Adverse impacts have been recorded for activities from 0.12 to 0.9 miles from the nesting site. Fishback (1994) reports occurrence of osprey at McCormack Lake. Time of year, activities (nesting or feeding) and a specific location are not given in the report. It is not known if osprey are nesting within the distance mentioned; however, inland nesting of ospreys is unlikely. If osprey do nest near the lake, they would most likely nest at the southern end of the lake because this is the area farthest removed from human development. This is approximately 0.6 miles from proposed Route 92. Therefore, there is potential for adverse impacts to any nesting osprey. However, nesting of osprey in this area is not likely since the area is far inland, and is proximal to human development (Scott's Corner Road, railroad tracks). The NJDEP Natural Heritage Program database (1995) contains no records of osprey within the USGS quadrangles containing the project area. There is no potentially suitable habitat for osprey within the project area itself. Therefore, the potential for impacts to osprey is low.

The barred owl typically inhabits forested wetlands and has been reported in the immediate vicinity of the project area. They have been documented to exhibit extreme avoidance to human activity such as major roadways. The proposed alignment does encroach on some potentially suitable barred owl habitat. Therefore, construction of the proposed Route 92 may impact this species by fragmentation of their habitat, particularly the forested areas north of McCormack Lake, and by causing avoidance of the highway area. The proposed alignment, however, is located south of a large

contiguous forested area that provides potentially suitable habitat for barred owl. More forested habitat is located south of the alignment between Friendship and Miller Roads, and between Miller Road and Route 130, and south of Miller Road in the forested wetlands along the Shallow Brook. Therefore, large areas of potential habitat for barred owl will remain intact in the general area.

Cooper's hawk may also be present within the project area, or in the immediate vicinity. Potentially suitable habitat within the project area consists of wood margins bordering open fields. This type of habitat is present outside of the project area as well. The presence of Cooper's hawk is increasing in New Jersey (Sherry Meyer, personal communication, 1995). Therefore, it is reasonable to conclude that they are not particularly sensitive to human activities. Although the proposed highway will disturb some potentially suitable habitat, large areas of forest edge bordering early successional field will be left intact. Construction of the highway will not cause significant reduction in nesting, resting or foraging habitat for this species. Therefore, this project has low potential impact to the Cooper's hawk.

Upland sandpiper, savannah sparrow and bobolink all have similar open-field habitat requirements. Size of the field is one of the most important characteristics of the habitat for determining the suitability for these species. The construction of the proposed highway will disturb some potentially suitable habitat for these grassland birds. The alignment fragments two successional field areas. One located east of the intersection of Routes 32 and 130 may provide habitat for bobolink, although none have been observed in this field. The other field, an upland island of approximately 25 acres, is located north of McCormack Lake and surrounded on three sides by forest. Because of its small size and proximity to wood margins, this field is unlikely to provide habitat for upland sandpiper since this species generally requires much larger areas of contiguous habitat. However, this field may be suitable for savannah sparrow and bobolink. Fragmentation of this field would reduce its suitability for these area-sensitive species. The large field west of Friendship Road, east of McCormack Lake and north of the Shallow Brook provides the best potentially suitable habitat within the immediate vicinity of the project area. The alignment runs along the northern edge of this field, thereby avoiding impacts due to fragmentation. Therefore the potential for impacts from the project is minimal for the upland sandpiper and low for savannah sparrow and bobolink. These species are not known to be particularly sensitive to human activity since they often utilize airports.

Wood turtles have not been documented within the immediate vicinity of the project (NJNHP, 1995; Fishback, 1994); however, there is potential habitat, albeit of low suitability, in the vicinity. If wood turtles are present in the vicinity, the proposed alignment would disturb some potentially suitable habitat through direct disturbance and potential water quality impacts. These potential impacts, however, would be minimized by engineering design. Box culverts that are currently proposed at stream crossings would provide routes for turtles to bypass the roadway, if necessary. Stormwater management and water quality treatment will be designed to minimize impacts to water quality. Therefore, potential impacts to wood turtles, if they are present in the area, would be minimal.

The potential for impacts to wildlife from the wetland minimization alignment of Route 92 is dependant upon the particular species. Most species known to be present in the project area are common to developed areas and thus should not be greatly affected. Habitat fragmentation will disrupt corridors for wildlife movement, particularly for mammals, and reduce habitat suitability for species that require large contiguous areas or interior habitats.

The Species of Concern with the highest potential to be impacted by the project is the barred owl. Forest fragmentation and increased human activity will reduce the suitability of one area of potential habitat for this species. Osprey may only be affected if nesting in the vicinity, which is not likely. One field that provides marginal potential habitat for savannah sparrow and bobolink will be bisected by the alignment. A larger field containing more suitable habitat for these species and the upland sandpiper will be relatively unaffected. The wood turtle, although not expected in the project area, could be present, but should not be significantly impacted by the project. Impacts to SOCs are summarized in Table 4 (Appendix A). Overall, the potential for adverse impacts to wildlife is low due to the linear nature of the project, concentration in agricultural areas and general avoidance of valuable habitat.

V. PRELIMINARY ASSESSMENT OF CONSTRAINTS TO DEVELOPMENT

Cooper's hawk, barred owl, savannah sparrow, upland sandpiper, bobolink and wood turtle were determined to be potentially present in the project area. Osprey was determined to be potentially present within one mile of the project area. Osprey and barred owl, if present, are the only rare species likely to be adversely impacted by the project. Only if osprey are nesting near McCormack Lake would this species be impacted by the project.

Of the species determined to be potentially present within the project area, barred owl, bobolink and wood turtle are considered by NJDEP to utilize wetlands. Therefore, the potential presence of these species may affect the resource value classification of wetlands in the project area (NJDEP, draft 1994). In New Jersey, those wetlands "which are present habitats for threatened or endangered species, or those which are documented habitats for threatened or endangered species, and which remain suitable for breeding, resting, or feeding by these species during the normal period these species would use the habitat" are classified as exceptional resource value wetlands (N.J.A.C. 7:7A-2.5). These wetlands are subject to 150 foot buffers, called transition areas. The exceptional resource value classification increases the constraints and limitations on the availability of general permits and transition area waivers for activities in wetlands. A determination of the resource value of wetlands in the project area is pending in an application submitted to NJDEP for a Letter of Interpretation.

Normally, transition area waivers can be granted in order to conduct certain activities in transition areas. In the case of exceptional resource value wetlands, however, transition areas can not be reduced to less than 75 feet unless the applicant demonstrates to the satisfaction of the NJDEP that the proposed activity would meet the standards for granting a freshwater wetlands permit if the activity were proposed in the wetland instead of the transition area. However, transition areas may not be reduced if the wetland contains a present or "documented habitat for threatened or endangered species" unless the applicant can demonstrate "no significant impact" (N.J.A.C. 7:7A-7.2 (c)1 and (g)). In addition, transition area averaging (reducing in some areas and compensating in others) will not be approved for exceptional resource value wetlands if "the freshwater wetland adjacent to the transition area is a breeding or nesting habitat for threatened or endangered species" (N.J.A.C. 7:7a-7.5(b)1). This determination is made by NJDEP.

The disturbance of habitat in wetlands and wetland transition areas, as required by the New Jersey Turnpike Authority for the construction of proposed Route 92 will require a Freshwater Wetlands Individual Permit. This permit will require, as a condition, a wetland restoration or mitigation plan.

Upland species are not afforded the same habitat protection as wetland species. There are no State regulations concerning development or disturbance of upland habitat for endangered or threatened species, except in the Pinelands and CAFRA Areas. Therefore, potential habitat for the savannah sparrow and upland sandpiper, and uplands used by

the other species potentially present in the project area, are not protected by regulation. Because there is no habitat for Federal-listed endangered or threatened species, the Federal Endangered Species Act of 1973 does not apply to this project. In addition, there are no Township ordinances regarding wildlife or endangered and threatened species that would pre-empt the existing State legislation (personal communications with Plainsboro, Monroe and South Brunswick Township representatives, 1995).

The State Endangered and Nongame Species Conservation Act (1973) regulates the taking (including harassment and killing) of endangered and nongame species. The NJDEP Division of Fish, Game and Wildlife will determine if this project complies with the Act.

VI. CONCLUSIONS AND RECOMMENDATIONS

The study area for the proposed Route 92 was surveyed for the presence of endangered or threatened species in mid-June through early August and in early October, 1995. The survey focused primarily on the following species: Cooper's hawk, red-shouldered hawk, upland sandpiper, barred owl, cliff swallow, loggerhead shrike, vesper sparrow, savannah sparrow, bobolink and wood turtle. Of the Species of Concern for the project area, only a great blue heron was definitively observed within or adjacent to the project area. However, based on reports of other sightings in the vicinity, Cooper's hawk, barred owl, upland sandpiper, savannah sparrow and bobolink may also be present in the study area. The most valuable area of potential habitat for these species is in the central portion of the study area, between the railroad and Friendship Road.

Forty-five species of birds, and several mammals, reptiles and amphibians were observed throughout the study area. The species observed are generally common to rural developed and agricultural areas. Additional species common to agricultural and developed areas, although not observed, would also be expected to inhabit the area. Common songbirds tended to be present primarily along hedgerows and wooded edges of early successional and agricultural fields. Raptors were mainly associated with forest edges of agricultural fields. Most birds were found to be associated with upland habitat. Mammals were found in nearly all habitat types, but were typically associated with hedgerows and forested wetlands. All mammals observed are common to agricultural/rural areas. Reptiles and amphibians were observed only in the forested wetlands or within the brook itself.

The greatest diversity of species was observed in upland fields (including agricultural), but was concentrated at hedgerows and forested edges. This habitat provides food, cover and nesting habitat for many avian species, which were the most abundant group of wildlife observed here. Small mammals such as rabbits and hedgehogs also thrive in this habitat.

Potential impacts to wildlife within the project area include direct loss of some habitat, fragmentation of habitats, particularly forested wetlands, and an increase in human activity in the project area. Impacts may also extend to wildlife that resides outside of the project area, but is sensitive to human disturbance (e.g., osprey).

The Wetlands Minimization Alignment was designed to avoid as much of the forested area as possible, and is concentrated in the open areas of the agricultural fields throughout the majority of the alignment. The agricultural areas support fewer species and a lower concentration of wildlife in general. Greater species diversity and concentration was observed in forest/field edges than in the forest interior. This forest edge habitat will generally be preserved by the alignment, thereby minimizing habitat loss. Approximately 32 acres of forest, however, will be lost. Since much of surrounding lands to the north and south of the project area are forested, direct impacts to wildlife from the loss of forest should be low. In addition, a wetland mitigation plan will be prepared to mitigate for the loss of the wetland areas of the forest.

The most significant area affected by forest fragmentation is in the area between Friendship Road and the Amtrak railroad tracks. This includes two "fingers" of forested wetland that provide corridors for wildlife, particularly mammals, to travel from the northern forest to fields within the project area and to McCormack Lake, south of the project area. Fragmenting this extension from the northern forest will make it difficult for some species to access the lake and fields. It is recommended that the eastern finger, which includes a portion of the Devil's Brook be bridged to provide a corridor for terrestrial species. The preliminary plans for the project include a 500' bridge span over this area. Bridging this area of forested wetlands will not only permit continued access to the fields and lake by wildlife, but will decrease wetland and stream impacts as well. A planted barrier or fencing should be used along adjacent areas of the highway outside of the wetlands to help funnel wildlife to the bridged area. A terrestrial corridor will also be provided to the west, along the railroad tracks, somewhat distant from the fields and lake, since the highway will be bridged over the tracks. A 400' bridge span is proposed for this area, in order to allow for the safe passage of wildlife on either side of the tracks. The

provision of wildlife corridors under the highway will reduce the adverse impacts of habitat fragmentation and human activities by allowing safe passage to and from the surrounding habitat. At other stream crossings (with permanent flow) that cannot be bridged, box culverts should be used to permit passage for fish, reptiles and amphibians. The bottom of the culverts should be set below the natural streambed and then lined with natural materials. It would be favorable to install box culverts during the late summer months (late July - early September), so as not to disturb hibernating turtles that may be present and to avoid impacts to spawning fish.

The proposed alignment primarily runs only along the edges of successional fields such as in the area of the existing dirt road on the Turkey Island Corporation property. In general, location of the alignment primarily along these edges will minimize the impact of habitat loss to species in these habitats. Two upland successional fields, however, will be bisected by the alignment. The proposed alignment currently fragments one early successional field that is juxtaposed between forested wetlands and McCormack Lake. This field, due to its position in the landscape and its habitat value for a large variety of wildlife, appears to be an area of importance within the alignment. While no endangered or threatened species were observed in this field, it provides potentially suitable habitat for savannah sparrow and bobolink, two of the SOC's. In addition, it provides suitable hunting ground for raptors, including the Cooper's hawk, which may possibly inhabit the adjacent forest edge. This field also provides habitat for wildlife species that may not be able to utilize the smaller fields remaining following fragmentation. A large population of eastern meadowlarks was observed here. This population might be lost following fragmentation. Fox, which are generally shy of human activity, were also observed in this field. At the northern end of the field is a treerow, surrounding the Devil's Brook. North of this treerow is a small upland field. This small field was observed to be inhabited by fewer species and less wildlife in general than the larger field described above. If it is possible, and economically feasible, to engineer the design of the alignment to pass north, rather than south of the treerow, fragmentation of the larger field could be avoided. The benefits gained by avoiding the fragmentation of the field would need to be weighed against increased wetland impacts, the potential for an additional stream crossing due to this change, and potential increased residential takings. The other field, located at the intersection of Routes 32 and 130, is small and only provides potentially suitable habitat for bobolink. Fragmentation of this field can not be avoided to meet the project objectives.

In summary, potential impacts to endangered and threatened species include the loss of potentially suitable habitat, forest fragmentation and human disturbance of the area for barred owl, the potential disturbance of osprey nesting activity, and loss or fragmentation of potentially suitable habitat for Cooper's hawk, savannah sparrow and bobolink and wood turtle. However, there is additional potentially suitable habitat for barred owl in forested wetlands outside of the project area, and there is no documentation of osprey nesting activity within this species' potential impact area. Potential impacts to Cooper's hawk, savannah sparrow and bobolink, that may be present in the study area, are expected to be low. The proposed alignment generally runs only along the edges of the most suitable habitat for the grassland birds, preserving the largest contiguous fields within the study area. However, as discussed above, fragmentation of the field north of McCormack Lake could potentially impact these species and other wildlife in the area. It is recommended that fragmentation of this field be avoided if feasible. Only a small amount of forest edge habitat will be lost to the Cooper's hawk. Since this species has not been shown to be sensitive to human activity, if it is present in the project area, impacts of construction of the highway are expected to be low.

The wetland mitigation plan to be prepared for the project, in accordance with the New Jersey Freshwater Wetlands Protection Act, will mitigate for the loss of wetland habitats for the endangered and threatened species potentially impacted by the project. In addition, periodic maintenance of stormwater management facilities should be adhered to in order to ensure that water quality in the vicinity is not compromised. The use of bridges and/or box culverts at the stream crossings will provide corridors for some wildlife between areas fragmented by the highway. A portion of the highway is proposed to bridge the existing railroad. The length of this crossing (400') should provide enough area under the bridge to provide a corridor for terrestrial wildlife in the vicinity. Impacts to threatened and endangered species and recommendations for reducing impacts are summarized in Table 4 (Appendix A).

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APPENDIX A

Table 2 - Habitat Suitability for Species of Concern

Table 3 - Wildlife Encountered within the Study Area

Table 4 - Impacts and Recommendations for Species of Concern

TABLE 2
HABITAT SUITABILITY FOR SPECIES OF CONCERN

Species Common Name	Optimal Habitat Type(s)	Breeding/ Nesting Season	Identified Within the Study Area?	Migration Dates (NJ) (**)	Habitat Rating(s) A. Breeding B. Other****	Location of Potential Habitat (s) Within the Project Area
pied–billed grebe	well vegetated lakes, ponds, and marshes	April–June	No	Arrives: March Departs: November	A. 0 B. 0	None
great blue heron	marshes, swamps, tidal flats	April–July	Yes	Arrives: March Departs: November	A. 0 B. 3	Impoundments north and south of dirt road; Turkey Island property, Devil's Brook and ag. flds.
American bittern	marshes, meadows	May–July	No	Arrives: April Departs: October	A. 0 B. 0	None
osprey	coastal, open water	May–August	No	Arrives: March Departs: October	A. 0 B. 0	None
northern harrier (marsh hawk)	marshes, wet meadows, coastal areas	May–June	Yes***	Permanent Resident	A. 0 B. 2	Wet meadow, hayfields/ cow pastures north and south of dirt road, Turkey Island property
Cooper's hawk	riparian forest margins	Spring: nesting resident	Possible Sighting	Some Resident	A. 2 B. 3	Forest northeast of McCormack Lake, Turkey Island property
red–shouldered hawk	swampy woods	Spring: uncommon nesting resident	No	Transient	A. 2 B. 2	Devil's Brook Area, forest northwest of McCormack Lake, Turkey Island property

(continued)

TABLE 2 (Continued)
HABITAT SUITABILITY FOR SPECIES OF CONCERN

Species Common Name	Optimal Habitat Type(s)	Breeding/ Nesting Season	Identified Within the Study Area?	Migration Dates (NJ) (**)	Habitat Rating(s) A. Breeding B. Other****	Location of Potential Habitat (s) Within the Project Area
*peregrine falcon	cosmopolitan, waterbody areas	March–June	No	Sept.–Oct. occasional winter resident	A. 0 B. 0	None
upland sandpiper	large grasslands, mowed or grazed, far from forest	May–July	Yes***	Arrives: April Departs: September	A. 2 B. 2	pasture and hayfields, Turkey Island property, central study area
red–headed woodpecker	open deciduous woods, parklike groves, forest edges	May–July	No	Permanent Resident	A. 1 B. 1	forest edges central study area, cow pasture, Turkey Island property, dead/dying decid. trees
barred owl	wetland and upland deciduous forest	March–May	Yes***	Permanent Resident	A. 3 B. 3	wetland forest(s) north of McCormack Lake, upland forest south and east of Friendship Rd.
cliff swallow	barn eaves, cliffs; agricultural fields	May–July	No	Arrives: April Departs: September	A. 2 B. 2	barn at western end of study area, near intersection of Ridge & Schalk's Crossing Roads
loggerhead shrike	hedgerows, cedar or hawthorns	?	No	Arrives: May Departs: September	A. 2 B. 2	hedgerows and barbed fencerows, cow pastures, Turkey Island property, edges of cedar forest betwn. Rt. 1 and RidgeRd. western end of project area
vesper sparrow	grasslands, 50 acres or more with hedgerows	May–July	No	Arrives: May Departs: November	A. 2 B. 2	grass fields (cow pasture) central study area, Turkey Island property, corn fields throughout site

(continued)

TABLE 2 (Continued)
HABITAT SUITABILITY FOR SPECIES OF CONCERN

Species Common Name	Optimal Habitat Type(s)	Breeding/ Nesting Season	Identified Within the Study Area?	Migration Dates (NJ) (**)	Habitat Rating(s) A. Breeding B. Other****	Location of Potential Habitat (s) Within the Project Area
savannah sparrow	short grass fields and salt marshes 25 acres or more	May–July	Yes***	Arrives: March Departs: November	A. 3 B. 3	mowed hayfield north of McCormack Lake, Turkey Island property, and wet emergent pasture
grasshopper sparrow	cultivated grasslands, old fields 200 acres or more	May–July	No	Arrives: March Departs: October	A. 1 B. 1	fields west of Friendship Road – Turkey Island property
Henslow's sparrow	low wet meadows, early succ. fields dense, unmowed, not brushy	May–July	No	Arrives: May Departs: October	A. 1 B. 1	fields west of Friendship Road – Turkey Island property
bobolink	dense fields, hayfields	May–June	Yes***	Arrives: May Departs: September	A. 3 B. 3	old fields north of Rte. 32; hayfields on Turkey Island property; old field east of Friendship Road, south of treerow
wood turtle	streams, rivers, forest (wetland or upland), fields	March–May OR Sept.–Oct.	No	Transition Dates: Mar.–May Sept.–Oct.	A. 2 B. 2	Wetlands, Devil's Brook area
bog turtle	open bogs, swamps, marshy meadows, pure water	April–July	No	N/A	A. 0 B. 0	None
triangle floater	aquatic, small streams	unknown	No	N/A	A. 1 B. 1	channelized area of Devil's Brook

(continued)

TABLE 2 (Continued)
HABITAT SUITABILITY FOR SPECIES OF CONCERN

Species Common Name	Optimal Habitat Type(s)	Breeding/ Nesting Season	Identified Within the Study Area?	Migration Dates (NJ) (**)	Habitat Rating(s) A. Breeding B. Other****	Location of Potential Habitat (s) Within the Project Area
brook floater	rapids of small rivers, creeks	unknown	No	N/A	A. 0 B. 0	None
yellow lampmussel	lacustrine, or large rivers	unknown	No	N/A	A. 0 B. 0	None

Notes:

* = Federal–listed endangered species
** = Leck, 1975.
*** = Sighting reported by Fishback (1994)
****= Feeding, cover or resting habitat

0 = no potential
1 = minimal potential
2 = low potential
3 = potential
4 = high potential

TABLE 3
ROUTE 92 WILDLIFE INVENTORY

HABITAT TYPES LEGEND	
OW = OPEN WATERS (Lake or Impoundment)	AG = AGRICULTURAL FIELD
F = FLYOVER	L = LAWN
S = STREAMSIDE	DF = DECIDUOUS FOREST
EW = EMERGENT WETLAND	OR = ORCHARD
FW = FORESTED WETLAND	RD = ROAD
EF = EARLY SUCCESS. FIELD	
LF = LATE SUCCESS. FIELD	

COMMON NAME *	SCIENTIFIC NAME **	HABITAT TYPE													COMMENTS
		OW	F	S	EW	FW	EF	LF	AG	L	DF	OR	RD		
WADING BIRDS (Herons, Egrets, Bitterns, Ibis)															
Great Blue Heron	*Ardea herodias*		X												TURKEY ISLAND PROPERTY
WATERFOWL (Swans, Geese, Ducks)															
Canada Goose	*Branta canadensis*		X												
DIURNAL RAPTORS (Vultures, Kites, Hawks Eagles)															
Turkey Vulture	*Cathartes aura*		X												OVER AG & FW
Cooper's Hawk	*Accipiter cooperii*		X												OVER FW
Red-tailed Hawk	*Buteo jamaicensis*		X				X		X						
American Kestrel	*Falco sparverius*						X								CHASED BY SMALLER BIRD; HOVERING; HEDGEROW
Sharp-shinned Hawk	*Accipiter striatus*								X						EDGE OF CORNFIELD; DOVE INTO CORNFIELD
Rough-legged Hawk	*Buteo lagopus*					X	X								
SHOREBIRDS (Plovers, Sandpipers, Phalaropes)															
Killdeer	*Charadrius vociferus*						X								
Greater Yellowlegs	*Tringa melnoleuca*						X								PUDDLE IN DISTURBED FIELD NEAR ROUTE 130
JAEGERS, GULLS, TERNS, ALCIDS															
Great Black-backed Gull	*Larus marinus*		X												

TABLE 3 (continued)
ROUTE 92 WILDLIFE INVENTORY

HABITAT TYPES LEGEND	
OW = OPEN WATERS (Lake or Impoundment)	AG = AGRICULTURAL FIELD
F = FLYOVER	L = LAWN
S = STREAMSIDE	DF = DECIDUOUS FOREST
EW = EMERGENT WETLAND	OR = ORCHARD
FW = FORESTED WETLAND	RD = ROAD
EF = EARLY SUCCESS. FIELD	
LF = LATE SUCCESS. FIELD	

COMMON NAME *	SCIENTIFIC NAME **	HABITAT TYPE												COMMENTS
		OW	F	S	EW	FW	EF	LF	AG	L	DF	OR	RD	
DOVES, OWLS, NIGHT JARS, WOODPECKERS														
Rock Dove	*Columba livia*		X				X							
Mourning Dove	*Zenaida macroura*		X				X	X	X				X	RD–PUDDLE DRINKING
Chimney Swift	*Chaetura pelagica*						X							NEAR FW EDGE
Belted Kingfisher	*Ceryle alcyon*			X					X					NEAR FW EDGE
Red–bellied Woodpecker	*Melanerpes carolinus*					X			X					
Downy Woodpecker	*Picoides pubescens*					X			X		X			
Hairy Woodpecker	*Picoides villosus*					X	X							EDGE OF FIELD
Northern Flicker	*Colaptes auratus*		X				X		X					ALSO FLYING OVER LAKE
Woodpecker sp.					X	X								FW–PERIMETER OF FIELD
FLYCATCHERS AND SWALLOWS														
Eastern Wood Pewee	*Contopus virens*					X			X		X			
Eastern Pheobe	*Sayornis phoebe*								X					EDGE
Eastern Kingbird	*Tyrannus tyrannus*					X	X		X		X			
Tree Swallow	*Tachycineta bicolor*		X				X					X		F–FORAGING OVER FIELD, GATES
No. Rough–winged Swallow	*Stelgidopteryx serripennis*		X											
Barn Swallow	*Hirundo rustica*		X				X		X					BARN EAVES; TELEPHONE WIRE; GATE
Flycatcher							X		X					HEDGEROW
JAYS, CROWS, CHICKADEES, TUFTED TITMOUSE, NUTHATCHES, BROWN CREEPER, WRENS														
Blue Jay	*Cyanocitta cristata*					X	X		X		X			NEAR FW EDGE
American Crow	*Corvus brachyrhynchos*		X				X		X					AG–FLYOVER
Fish Crow	*Corvus ossifragus*		X						X					
Black–capped Chickadee	*Parus atricapillus*					X			X					EDGES AND HEDGEROWS
Tufted Titmouse	*Parus bicolor*					X			X					EDGES AND HEDGEROWS
Carolina Wren	*Thryothorus ludovicianus*								X					EDGES AND HEDGEROWS
House Wren	*Troglodytes aedon*						X	X	X	X	X			EDGES AND HEDGEROWS

TABLE 3 (continued)
ROUTE 92 WILDLIFE INVENTORY

HABITAT TYPES LEGEND	
OW = OPEN WATERS (Lake or Impoundment)	AG = AGRICULTURAL FIELD
F = FLYOVER	L = LAWN
S = STREAMSIDE	DF = DECIDUOUS FOREST
EW = EMERGENT WETLAND	OR = ORCHARD
FW = FORESTED WETLAND	RD = ROAD
EF = EARLY SUCCESS. FIELD	
LF = LATE SUCCESS. FIELD	

COMMON NAME *	SCIENTIFIC NAME **	HABITAT TYPE													COMMENTS
		OW	F	S	EW	FW	EF	LF	AG	L	DF	OR	RD		
KINGLETS, GNATCATCHER, THRUSHES, MOCKINGBIRDS, SHRIKES, STARLINGS															
Wood Thrush	*Hylocichla mustelina*					X		X			X				
American Robin	*Turdus migratorius*		X		X	X	X	X	X	X	X		X		
Gray Catbird	*Dumetella carolinensis*		X	X		X	X	X	X		X				JUVENILE ALSO SEEN ALONG STREAM
Northern Mockingbird	*Mimus polyglottos*		X				X	X	X	X	X		X		
Brown Thrasher	*Toxostoma rufum*								X	X					EDGE OF FOREST
Cedar Waxwing	*Bombycilla cedrorum*							X							
European Starling	*Sturnus vulgaris*		X						X	X		X			
Eastern Bluebird	*Sialia sialis*									X					
VIREOS, WARBLERS															
Common Yellowthroat	*Geothlypis trichas*					X	X	X	X		X				EF–ROSE; HEDGE ROW; FW EDGE
TANAGERS, GROSBEAKS, BUNTINGS, SPARROWS															
Scarlet Tanager	*Piranga olivacea*					X									
Northern Cardinal	*Cardinalis cardinalis*		X				X		X	X					
Rose–breasted Grosbeak	*Pheucticus ludovicianus*						X								EDGE
Indigo Bunting	*Passerina cyanea*						X	X	X				X		PHONE WIRE; EDGE
Rufous–sided Towhee	*Pipilo erythrophtholmus*					X	X		X		X				WOODS AROUND FLD.; DF/AG–WET EDGE; JUVENILE
American Tree Sparrow	*Spizella arborea*		X								X				
Chipping Sparrow	*Spizella passerina*						X		X						MAINLY HEDGEROWS
Field Sparrow	*Spizella pusilla*						X		X	X	X				MAINLY HEDGEROWS
Song Sparrow	*Melospiza melodia*						X	X	X			X			MAINLY HEDGEROWS

TABLE 3 (continued)
ROUTE 92 WILDLIFE INVENTORY

HABITAT TYPES LEGEND	
OW = OPEN WATERS (Lake or Impoundment)	AG = AGRICULTURAL FIELD
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EF = EARLY SUCCESS. FIELD	
LF = LATE SUCCESS. FIELD	

COMMON NAME *	SCIENTIFIC NAME **	HABITAT TYPE													COMMENTS
		OW	F	S	EW	FW	EF	LF	AG	L	DF	OR	RD		
BLACKBIRDS, ORIOLES, FINCHES, HOUSE SPARROW															
Red-winged Blackbird	*Agelaius phoeniceus*						X		X						EDGES
Eastern Meadowlark	*Sturnella magna*						X		X						AG-FLYING, LANDING; FIELDS-FORAGING
Common Grackle	*Molothrus ater*		X				X		X						EF-ROSE
Brown-headed Cowbird	*Icterus spurius*		X				X		X			X			HEDGEROWS, EDGES
House Finch	*Carpodacus mexicanus*							X							WIRE
American Goldfinch	*Carduelis pinus*		X				X	X	X			X			ALSO FLYING OVER LAKE
MAMMALS															
Eastern Chipmunk	*Tamias Striatus*					X				X			X		
White-tailed Deer	*Odocoileus virginianus*			X		X	X	X	X						TRAILS; FW-EDGE OF EF
Gray Squirrel	*Sciurus carolinensus*					X			X						NEST IN TREE
Woodchuck	*Marmota monax*					X	X		X						HOLES AT TOP OF STREAMBANK; EF-FORAGING
Raccoon	*Procyon lotor*			X											
Eastern Cottontail	*Sylvilagus floridanus*						X			X					
Opossum	*Didelphis marsupialis*			X											PRINTS
Fox (red or gray)				X											
REPTILES/AMPHIBIANS															
Eastern Garter Snake	*Thamnophis s. sirtalis*					X									OW--EDGE - RESTING IN SHRUB
Eastern Painted Turtle	*Chrysemy p. picta*	X				X									MANY BASKING/FLOATING IN SMALL IMPOUNDMENT
Box Turtle	*Terrapene c. carolina*					X									
Leopard Frog	*Rana spenocephala*			X		X									
Green Frog	*Rana clamitans melanota*	X		X		X									
Red-backed Salamander	*Plethodon c. cinereus*					X									UNDER LOGS

NOTES:

* Common names for birds according to "ABA Checklist; Birds of the Continental United States and Canada", by the American Birding Association, 4th Edition, 1990. Common names for mammals, reptiles and amphibians according to "New Jersey's Wildlife: A Checklist of Birds, Mammals, Reptiles and Amphibians", by the NJ Department of Environmental Protection, Division of Fish, Game and Wildlife.

** Latin names and order for birds according to "ABA Checklist; Birds of the Continental United States and Canada:, by the American Birding Association, 4th Edition, 1990. Latin names for mammals, reptiles and amphibians according to "New Jersey's Wildlife: A Checklist of Birds, Mammals, Reptiles and Amphibians", by the NJ Department of Environmental Protection, Division of Fish, Game and Wildlife.

TABLE 4
IMPACTS AND RECOMMENDATIONS FOR SPECIES OF CONCERN*

Species of Concern (Common Name)	Impacts of Project	Recommendations for Reducing Impacts
great blue heron	None	None
osprey	potential disturbance of nesting activity – if nesting at McCormack Lake	None – nesting not likely
northern harrier (marsh hawk)	None	None
Cooper's hawk	low potential for impact – some loss of forest and edge habitat	None
red–shouldered hawk	None	None
upland sandpiper	None – alignment skirts only edges of potentially suitable habitat	None
red–headed woodpecker	None	None

TABLE 4
IMPACTS AND RECOMMENDATIONS FOR SPECIES OF CONCERN*

Species of Concern (Common Name)	Impacts of Project	Recommendations for Reducing Impacts
barred owl	disturbance and fragmentation of potentially suitable habitat	None feasible
cliff swallow	None	None
loggerhead shrike	None	None
vesper sparrow	None	None
savannah sparrow	disturbance/fragmentation of potentially suitable habitat (upland field north of McCormack Lake)	Shift alignment north of upland field
grasshopper sparrow	None	None

TABLE 4
IMPACTS AND RECOMMENDATIONS FOR SPECIES OF CONCERN*

Species of Concern (Common Name)	Impacts of Project	Recommendations for Reducing Impacts
Henslow's sparrow	None	None
bobolink	disturbance/fragmentation of potentially suitable habitat (upland field north of McCormack Lake, old fields north of Route 32)	Shift alignment north of upland field near lake
wood turtle	minimal impact, if present – disturbance of potentially suitable habitat (wetlands), potential water quality impacts (can be mitigated)	1. bridge over the Devil's Brook, and use of box culverts at minor crossings 2. construction near stream only in late July to early September
triangle floater	None	None

*Note:
Pied–billed grebe, American bittern, peregrine falcon, bog turtle, brook floater and yellow lampmussel will not be impacted by the project since no habitat exists for these species within the study area.

APPENDIX B

Correspondence/Coordination with the Division of Fish, Game and Wildlife

Christine Todd Whitman
Governor

State of New Jersey
Department of Environmental Protection
Division of Fish, Game and Wildlife
Box 383, R.D. 1
Hampton, N.J. 08827
Phone (908) 735-8975
Fax (908) 735 5639

Robert C. Shinn, Jr.
Commissioner

April 21, 1995

Ms. Christine Tiernan-Varricchio
Frederic R. Harris, Inc.
Metropolitan Corp. Plaza
Iselin, NJ 08830

Dear Ms. Tiernan-Varricchio:

As per your request, this is our recommendation regarding wildlife inventory needs to evaluate the proposed Route 92 potential impacts to endangered, threatened and rare wildlife species.

Attached you will find a list of endangered, threatened and rare wildlife species that could potentially occur within the proposed alignments. We suggest that the potentially affected habitats within the alignment be evaluated for their suitability for the listed species. Any areas within the alignment that are suitable for the listed species should then be surveyed for the presence or absence of those species during appropriate seasons and using survey methodologies commonly employed to find each species. The results of the surveys, if performed properly, can be used to identify potential impacts to populations of any of the listed species that occur within the project area.

Sincerely,

James C. Sciascia

James C. Sciascia
Principal Nongame Zoologist
Endangered and Nongame Species Program

Endangered, Threatened and Rare Wildlife Species Occurring in Somerset and Middlesex Counties

Common Name	Heritage Rank	State Status	Federal Status
~~BLUE-SPOTTED SALAMANDER~~	~~S1~~	~~E~~	
~~LONGTAIL SALAMANDER~~	~~S2~~	~~E~~	
~~PINE BARRENS TREEFROG~~	~~S3~~	~~T~~	3C
PIED-BILLED GREBE	S1	E/S	
GREAT BLUE HERON	S2	T/S	
~~YELLOW-CROWNED NIGHT HERON~~	~~S2~~	~~T/T~~	
NORTHERN HARRIER	S2	E/U	
COOPER'S HAWK	S2	E	
RED-SHOULDERED HAWK	S2	E/T	
PEREGRINE FALCON	S1	E	E/SA
UPLAND SANDPIPER	S1	E	
BARRED OWL	S3	T/T	
RED-HEADED WOODPECKER	S3	T/T	
CLIFF SWALLOW	S2	T	
LOGGERHEAD SHRIKE	S1	E	C2
VESPER SPARROW	S2	E	
SAVANNAH SPARROW	S2	T/T	
GRASSHOPPER SPARROW	S2	T/T	
HENSLOW'S SPARROW	S1	E	C2
BOBOLINK	S2	T/T	
WOOD TURTLE	S3	T	
BOG TURTLE	S2	E	C2
TRIANGLE FLOATER	S3		
BROOK FLOATER	S1		C2
YELLOW LAMPMUSSEL	S1		C2
American Bittern	S3	T	
Osprey	S3	T	

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.
18 COMMERCE STREET PLAZA • FLEMINGTON, NJ 08822
(908) 788-9676 • FAX (908) 788-6788
PA (610) 250-0773

CONVERSATION LOG

JOB NUMBER: 1244
JOB NAME: Route 92
DATE: 6/28/95
TIME: 2:50
YOUR NAME: Lisa Brave
SPOKE TO: Jim Sciasca
COMP.NAME: NJDEP
TEL. # (908) 735-8975

Content of Conversation:

He remembers the project. He will fax a copy of a list of the Species of Concern for the project to me.

I mentioned the Walker-Gordon study and the 47 sightings, and their possible inclusion in the new Natural Heritage letter that is being ordered. He said it is highly unlikely to have had 47 sightings of E&T species as there are only 61 listed, and many are whales. They (Walker-Gordon) probably included "rare" species. Also, to be considered by Natural Heritage, sightings must meet certain criteria, such as sighting during the nesting season. Flyovers wouldn't meet the criteria. **We should be concerned with the species he outlined in his letter to Christine, which he is faxing.**

The NINJA database has shifted it's emphasis from recording sightings to Natural History information on the species.

Copy to: Lois
File

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.
18 COMMERCE STREET PLAZA • FLEMINGTON, NJ 08822
(908) 788-9676 • FAX (908) 788-6788
PA (610) 250-0773

CONVERSATION LOG

JOB NUMBER: 1244
JOB NAME: Route 92
DATE: 7/17/95
TIME: 3:30
YOUR NAME: Lisa Brave
SPOKE TO: Mike Valent
COMP.NAME: NJDEP Fish, Game and Wildlife
TEL. # 735-8975

Content of Conversation:

I asked Mike if my planned methodology would be sufficient, explained what we were doing and also asked many questions.

According to Mike, the best time to do the call search for barred owl is after sunset (look up time of sunset) and we could go until 1 to 2 a.m. Play a call set for about 10 seconds, then wait 50-60 seconds. Do this six times, then wait 5 minutes for owls to answer. They can respond from up to 1 mile away, but you probably wouldn't hear them if they're that far. 100 decibels is the optimal noise level for playing the recording. He will give us a recording if I can pick it up today by 4:25.

Mike said it's very late in the season to be doing this. They are no longer nesting and so won't be as responsive. Also, if we do hear them, we can't say they are nesting because they are a resident species, and won't necessarily (although likely) be using the habitat we hear them in now to breed.

They do successfully coexist with great horned owls, although great horneds have an edge over barreds if the habitat is fragmented. In large contiguous tracts, they'll do just fine.

We should do the survey in the same places **at least** twice, 7 to 10 days apart (he does each site 5 times). Approximately 3/4 mile intervals is fine to play the tape.

Don't use your flashlight during the survey. It will be of no advantage to climb a treestand, just stay on the ground. Therefore, 1 point in each of the three forested areas should be fine.

Copy to: Lois
Peg
File

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.
18 COMMERCE STREET PLAZA • FLEMINGTON, NJ 08822
(908) 788-9676 • FAX (908) 788-6788
PA (610) 250-0773

CONVERSATION LOG

JOB NUMBER: 1244
JOB NAME: Route 92
DATE: 8/8/95
TIME: 10:15
YOUR NAME: Lisa Brave
SPOKE TO: Jeanette Bowers
COMP.NAME: NJDEP Div. of Fish, Game & Wildlife - End. Species
TEL. # (609) 292-2084

Content of Conversation:

I asked Jeanette for information on the Brook Floater, Triangle Floater and Yellow Lampmussel; descriptions, habitat and search methodologies.

The brook floater and yellow lampmussel are Category 2, Federal Candidate species, very rare. New Jersey would like to have them listed immediately. Jeanette believes that the brook floater is currently only known in the Stoney Brook, Mercer County, NJ. Any records for Middlesex County would be very old (1910 or thereabout). However, she will look it up and send me the information. It is, as the name indicates, a brook species. The yellow lampmussel is a big river species, although it can live in large brooks. Neither of the above species "love lakes", as they are too stagnant, but it is possible they could live in one.

The triangle floater is less rare than the other two. It is more tolerant of stagnant conditions and may utilize lake habitat. It is not a candidate species.

Methodologies for finding these species are highly variable, depending on budget. They range from running transects with a viewing bucket (with a plexiglass bottom) to SCUBA dive searches.

Jeanette will gather as much information as she has on all three species and search methodologies and send it as soon as possible.

Copy to: File

1244

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection

Robert C. Shinn, Jr.
Commissioner

DIVISION OF FISH, GAME AND WILDLIFE
ROBERT MCDOWELL, DIRECTOR
CN 400
TRENTON, NJ 08625-0400
609-292-2965
609-984-1414 FAX

14 August 1995

Ms. Lisa Brave
Amy Green Environmental Consultants
18 Commerce Street Plaza
Flemington, NJ 08822

Dear Ms. Brave:

Per your recent request regarding Middlesex County locations of the brook floater, yellow lampmussel and triangle floater, there was one recent (1994) sighting of a triangle floater shell in Middlesex County in Heathcote Brook, between the D & R canal and Carnegie Lake. There are no known occurrences of the brook floater or yellow lampmussel in the county. I have enclosed information on these three species, along with a key to freshwater bivalves.

Please contact me if you have any questions or need additional information.

Sincerely,

Jeanette Bowers-Altman

Jeanette Bowers-Altman
Senior Zoologist
Endangered & Nongame Species Program
609-292-9451

Enclosures

APPENDIX C

Natural Heritage Program Database Information

Christine Todd Whitman
Governor

State of New Jersey
Department of Environmental Protection
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
CN 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

Robert C. Shinn, Jr.
Commissioner

August 2, 1995

Sean Vroom
Frederic R. Harris, Inc.
Metropolitan Corporate Plaza
Office Building B
485 US Route 1 South
Iselin, NJ 08830

Re: Proposed Route 92

Dear Mr. Vroom:

Thank you for your data request regarding rare species information for the above referenced project site in Middlesex County.

The Natural Heritage Data Base has records for occurrences of barred owl, *Ranunculus pusillus* and *Sagittaria australis* which may be on the project site. There is a record for a savannah sparrow occurrence which may be on, or in the immediate vicinity of the site. Additionally, there are records for occurrences of bobolink, *Anax longipes*, *Elatine americana*, *Gentiana saponaria*, *Isoetes riparia*, *Limosella acaulis*, *Myriophyllum tenellum*, *Stachys hyssopifolia*, *Utricuaria gibba* and *Viola brittoniana* in the immediate vicinity of the site. The attached list provides more information about all these occurrences.

Also attached are lists of rare species which have been documented from the Hightstown and Jamesburg USGS quadrangles. Also attached is a list of rare species and natural communities which have been documented from Middlesex County. If suitable habitat is present at the project site, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish, Game and Wildlife, Endangered and Nongame Species Program.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice

details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Thomas F. Breden
Supervisor

cc: Lawrence Niles
Thomas Hampton
NHP File No. 95-4007435

02 AUG 1995

ON OR IN THE IMMEDIATE VICINITY OF PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.	LOCATION
*** Vertebrates									
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2	1994-05-15	Y	FROM THE TOWN OF PLAINSBORO, EAST ON DEY ROAD, LEFT ONTO SCOTT'S CORNER ROAD, ONE MILE TO SHARP BEND IN ROAD. TAKE DRIVEWAY INTO THE FARM TO THE FIELDS ON THE LEFT, NW OF THE BARN.
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2	1994-04-30	Y	FROM THE TOWN OF PLAINSBORO, EAST ON DEY ROAD, LEFT ONTO SCOTT'S CORNER ROAD, ONE MILE TO SHARP BEND IN ROAD. TAKE DRIVEWAY INTO THE FARM TO THE WETLAND MEADOW AND ADJACENT PLOWED FIELDS.
STRIX VARIA	BARRED OWL		T/T		G5	S3	1993-12-09		HEADWATERS OF A TRIBUTARY TO THE DEVIL'S BROOK, EAST OF THE AMTRACK LINE, AND NW OF THE MAN-MADE LAKE WEST OF SCOTTS CORNER-MONMOUTH JUNCTION ROAD.
*** Invertebrates									
ANAX LONGIPES	COMET DARNER				G5	S2?	1994-07-10	Y	FROM THE TOWN OF PLAINSBORO, EAST ON DEY ROAD, LEFT ONTO SCOTT'S CORNER ROAD, ONE MILE TO SHARP BEND IN ROAD. APPROXIMATELY 3/4 MILE TO THE NORTH-NORTHWEST, BETWEEN MCCORMICK LAKE AND THE AMTRACK LINE.

ON OR IN THE IMMEDIATE VICINITY OF PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.	LOCATION
*** Vascular plants									
ELATINE AMERICANA	AMERICAN WATERWORT				G4	S2	1994-10-05	Y	NORTH END OF MCCORMACK LAKE, APPROXIMATELY 2.0 MILES NORTH EAST OF JUNCTION OF SCHALKS RD. AND PRINCETON-CRANBURY RD., PLAINSBORO.
GENTIANA SAPONARIA	SOAPWORT GENTIAN				G5	S3	1994-10-05	Y	NORTH SIDE OF MCCORMACK LAKE, APPROXIMATELY 1.3 MILES NORTH NORTHWEST OF SCOTT'S CORNER.
ISOETES RIPARIA	RIVER-BANK QUILLWORT				G4	S3	1994-10-05	Y	SOUTHEAST SIDE OF NORTHERNMOST FINGER OF MCCORMACK LAKE, APPROXIMATELY 1.2 MILES NORTH NORTHWEST OF SCOTT'S CORNER.
LIMOSELLA ACAULIS	SOUTHERN MUDWORT				G5	SU	1994-10-05	Y	MCCORMACK LAKE, APPROXIMATELY 2.0 MILES NORTHEAST OF JUNCTION OF SCHALKS RD. AND PRINCETON-CRANBERRY RD., PLAINSBORO.
MYRIOPHYLLUM TENELLUM	SLENDER WATER-MILFOIL		E		G5	S1	1994-10-05	Y	NORTH END OF MCCORMACKS LAKE, APPROXIMATELY 2.0 MILES NORTHEAST OF JUNCTION OF SCHALKS RD. AND CRANBURY-PRINCETON RD., PLAINSBORO.
RANUNCULUS PUSILLUS	LOW SPEARWORT				G5	S2	1994-05-11	Y	NORTH SIDE OF BRANCH OF DEVIL'S BROOK APPROXIMATELY 1.4 MILES NORTH OF SCOTT'S CORNER.

ON OR IN THE IMMEDIATE VICINITY OF PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.	LOCATION
SAGITTARIA AUSTRALIS	SOUTHERN ARROW HEAD		E		G5	S1	1994-10-05	Y	EAST SIDE OF DEVILS BROOK APPROXIMATELY 0.2 MILE NORTHEAST OF NORTH END OF MCCORMACK LAKE AND APPROXIMATELY 1.4 MILES NORTH NORTHWEST OF SCOTT'S CORNER. ALSO PRESENT IN COVE ON SOUTHWEST SIDE OF LAKE.
STACHYS HYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2	1994-07-13	Y	WEST SIDE OF SCOTT'S CORNER RD. AT ITS INTERSECTION WITH BROADWAY RD., 1 MILE NORTH OF SCOTT'S CORNER.
UTRICULARIA GIBBA	HUMPED BLADDERWORT			LP	G5	S3	1994-07-13	Y	NORTH END AND EAST SIDE OF MCCORMACK LAKE, APPROXIMATELY 2.0 MILES NORTHEAST OF THE JUNCTION OF SCHALKS RD. AND PRINCETON-CRANBURY RD.
VIOLA BRITTONIANA	COAST VIOLET				G4G5	S3	1994-10-05	Y	NORTH SHORE OF MCCORMACK LAKE, APPROXIMATELY 1.2 MILES NORTH NORTHWEST OF SCOTT'S CORNER.

14 Records Processed

AUG 1995

HIGHTSTOWN USGS QUADRANGLE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

ME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
* Vertebrates								
MODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/T		G5	S2	1981-SUMMR	Y
IO OTUS	LONG-EARED OWL		T/T		G5	S3	1995-03-27	Y
RTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5	S1	1976-??-??	Y
EMMYS INSCULPTA	WOOD TURTLE		T		G4	S3	1986-SUMMR	Y
EMMYS INSCULPTA	WOOD TURTLE		T		G4	S3	1991-??-??	
LICHONYX ORYZIVORUS	BOBOLINK		T/T		G5	S2	1994-05-15	Y
SSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2	1982-??-??	Y
SSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5	S2	1994-04-30	Y
RIX VARIA	BARRED OWL		T/T		G5	S3	1993-12-09	
* Invertebrates								
ASHIDONTA UNDULATA	TRIANGLE FLOATER				G4	S3	1994-09-30	Y
IAX LONGIPES	COMET DARNER				G5	S2?	1984-07-17	Y
IAX LONGIPES	COMET DARNER				G5	S2?	1994-07-10	Y
LITHEMIS MARTHA	MARTHA'S PENNANT				G4	S3S4	1984-08-17	Y
STES EURINUS	AMBER-WINGED SPREADWING				G4	S1?	1984-07-17	Y
CROPHORUS AMERICANUS	AMERICAN BURYING BEETLE	LE	E		G1	SH	1919-??-??	Y
MPETRUM AMBIGUUM	BLUE-FACED MEADOWFLY				G5	S1?	1991-08-25	Y
* Vascular plants								
REX BARRATTII	BARRATT'S SEDGE	3C		LP	G4	S4	1938-04-24	Y
ATINE AMERICANA	AMERICAN WATERWORT				G4	S2	1994-10-05	Y
PHORBIA MARILANDICA	MARYLAND SPURGE		E		G1?Q	SH.1	1922-05-28	Y
NTIANA SAPONARIA	SOAPWORT GENTIAN				G5	S3	1994-10-05	Y
OETES RIPARIA	RIVER-BANK QUILLWORT				G4	S3	1994-10-05	Y
MOSELLA ACAULIS	SOUTHERN MUDWORT				G5	SU	1994-10-05	Y
STERA AUSTRALIS	SOUTHERN TWAYBLADE			LP	G4	S2	1994-05-02	Y
LANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1	1915-08-??	Y
MULUS ALATUS	WINGED MONKEY FLOWER				G5	S3	1994-10-05	Y

HIGHTSTOWN USGS QUADRANGLE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
MYRIOPHYLLUM TENELLUM	SLENDER WATER-MILFOIL		E		G5	S1	1994-10-05	Y
RANUNCULUS PUSILLUS	LOW SPEARWORT				G5	S2	1890-??-??	Y
RANUNCULUS PUSILLUS	LOW SPEARWORT				G5	S2	1994-05-11	Y
SAGITTARIA AUSTRALIS	SOUTHERN ARROW HEAD		E		G5	S1	1994-10-05	Y
STACHYS NYSSOPIFOLIA	HYSSOP HEDGE-NETTLE				G5	S2	1994-07-13	Y
UTRICULARIA GIBBA	HUMPED BLADDERWORT			LP	G5	S3	1994-07-13	Y
VIOLA BRITTONIANA	COAST VIOLET				G4G5	S3	1994-10-05	Y
WOLFFIA PAPULIFERA	POINTED DUCKWEED				G4	S3	1993-08-27	Y

33 Records Processed

JAMESBURG USGS QUADRANGLE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.
*** Vertebrates								
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4	S3	1983-05-24	
HYLA ANDERSONII	PINE BARRENS TREEFROG	3C	E		G4	S3	????-??-??	Y
*** Invertebrates								
BOLORIA SELENE MYRINA	A SILVER-BORDERED FRITILLARY				G5T5	S2S4	1901-08-25	Y
INCISALIA IRUS	FROSTED ELFIN				G4	SU	1910-03-29	Y
SPEYERIA IDALIA	REGAL FRITILLARY	C2			G3	SX	1902-07-02	Y
*** Vascular plants								
CAREX BARRATTII	BARRATT'S SEDGE	3C		LP	G4	S4	1941-11-27	Y
LIATRIS SCARIOSA VAR NOVAE-ANGLIAE	NORTHERN BLAZING STAR	C2	E		G5?T3	SH	1940-09-29	Y
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5	S1	????-??-??	Y

8 Records Processed

APPENDIX D

Preparer's Qualifications

AMY S. GREENE
President

AREAS OF EXPERTISE: Aquatic, Terrestrial and Wetlands Ecology, Wetlands Mitigation, Environmental Impact Assessment, Endangered and Threatened Species Habitat Assessment, Natural Resources Inventory, Environmentally Sensitive Area Mapping

EDUCATION: M.S. Ecology, Rutgers University, 1984
B.A. Biology, Boston University, 1974

CERTIFICATES: Certified Wetlands Delineator, US Army Corps of Engineers, 1993

Certified Ecologist/Ornithologist, NJDEP Bureau of Discharge Prevention.

Certified Ecologist, Ecological Association of America

Certificate of Completion in Jurisdictional Delineation of Wetlands in the Mid-Atlantic States, New Brunswick, NJ - June 1988

Certificate of Completion in Wetlands Functions and Values (WET), Chincoteaque, VA July 1990

Certificate of Completion, 40 Hour OSHA Health and Safety Training Course for Hazardous Waste Site Workers

U.S. Fish and Wildlife Service, Habitat Evaluation Procedures Certified 1982

PROFESSIONAL EXPERIENCE: Ms. Greene is President and owner of AMY S. GREENE ENVIRONMENTAL CONSULTANTS, INC. and as such has been providing professional environmental services to private and public sector clients since February 1986. She is recognized as an expert in the field of wetlands science, natural resources inventory, and environmental impact assessment. She has presented guest lectures at universities and educational seminars. She has been selected as mediator in litigation involving wetlands impacts and restoration.

Ms. Greene has twenty (20) years experience in the performance and management of environmental studies. She has prepared wetland evaluations, delineations and mitigation plans for coastal and inland wetlands. She has also conducted wildlife habitat evaluations, natural resources inventories and environmental impact assessments. Projects completed have entailed environmental planning for residential, commercial, industrial and recreation development and wastewater, sludge, solid waste and transportation facilities. Ms. Greene has prepared successful State and Federal permit applications for wetlands filling, waterways dredging, coastal zone development, stream encroachment, pollutant discharge, soil erosion and sediment control plans, NJ Pinelands development and hazardous waste facilities. She has prepared numerous environmentally sensitive area protection plans for industrial facilities throughout New Jersey.

Ms. Greene has been principally responsible for performance of the following representative projects:

Burlington County Sludge and Septage Management Plan. This project included preparation of environmentally sensitive area maps for all of Burlington County in accordance with Federal Clean Water Act requirements. Identification and environmental impact assessment of sludge and septage treatment, re-use and disposal options were performed.

Howland Hook Marine Terminal Expansion, Staten Island, N.Y. New York City Parks and Terminals and Port Authority of New York. Environmental Impact Report for submission to the U.S. Army Corps of Engineers, NY District, for an individual 404 dredge and fill permit. Wetland mapping, evaluation and impact mitigation, and protection of critical bird breeding areas were central issues.

Burlington City/Burlington Township Wastewater Facilities Management Plan. A natural resources inventory for the study area was prepared. Environmentally sensitive area mapping was performed. These tasks identified unique terrestrial and aquatic biological resources as well as physical resources of the municipalities and the Delaware River in the vicinity of the study area. Environmental impacts of proposed wastewater management alternatives were assessed.

Berkshire Valley Road Expansion Environmental Impact Assessment, Morris and Passaic Counties, NJ, New Jersey Department of Transportation. Natural, socioeconomic and cultural resources inventory and environmental impact assessment of roadway widening. Issues included assessment of endangered and threatened species habitat and mitigation of cultural resources.

Burlington County, NJ, Solid Waste Management Facilities Complex, Environmental Impact Statement. Inventory of natural, socioeconomic and cultural resources at a proposed solid waste management site. Master Plan development and evaluation of environmental impacts of proposed facilities including a sanitary landfill, co-composting facility and leachate treatment plant. Permit applications were prepared for a wetland fill permit, discharge to surface water permit and 208 consistency determination. Inspections of the wetlands mitigation site in accordance with the 404 permit were conducted by Amy S. Greene Environmental Consultants, Inc.

Leisuretowne Southampton Township, Burlington County, NJ, wetlands delineation was performed and wetlands fill authorization obtained from the US Army Corps of Engineers for proposed residential development. This authorization was obtained to satisfy a condition of the NJ Pinelands Commission Waiver of Strict Compliance.

US Army Depots, PA Environmental Assessments of three Army Hazardous Waste Management sites. Physical, biological and cultural resources were inventoried for each site. Impacts on these resources from operation of the facilities were assessed.

Ecological Analysis of Leisure Technology, Inc. property and adjacent properties in Berkeley Township, Ocean County, NJ. Detailed vegetation, soils, wildlife and aquatic biota studies were performed to assess the resource utilization potential for the properties relative to surrounding properties.

O&Y Old Bridge Development Site Wetlands Delineation for 2,700 acre parcel in Old Bridge, Middlesex County, NJ. This site was located at the boundary of the northern extent of pitch pine/oak vegetation communities in New Jersey.

Arthur Kill Generating Station, Tidal Wetlands Survey and Mitigation Plan, Staten Island, NY, Consolidated Edison Co. Wetland communities were mapped and evaluated for preparation of a NY State Tidal Wetlands Permit application. Detailed analyses were performed regarding geology, soils, hydrology, estuarine biota, and wildlife to assess the origin and resource value of onsite wetlands.

Eleanor Roosevelt National Historic Site Natural Resources Inventory, Hyde Park, NY, National Park Service. Monitoring, mapping and description of natural resources, including vegetation and wildlife, aquatic biota, water resources, soils and geology.

Francis E. Walter Dam, PA, Environmental Impact Assessment. Terrestrial and aquatic bioecological, physical, and socioeconomic resources were inventoried. Potential impacts on these resources from increasing the reservoir area from 90 acres to 1,000 acres were assessed. Issues included Delaware River Basin water supply, protection of downstream coldwater fisheries, and loss of terrestrial habitat.

Sussex and Nassau Counties Low Flow Augmentation Needs Study, US Environmental Protection Agency. The study entailed analysis of stream quality to determine the need for low flow augmentation following sewering of the region. Ms. Greene was responsible for analysis of fish species assemblage data to evaluate stream quality.

Cohansey River Dredging Project, Environmental Impact Assessment, US Army Corps of Engineers, Philadelphia District. Riverine, economic and wetlands impacts from the proposed dredging project were assessed. Issues included protection of the oyster beds in Delaware Bay and avoidance of wetlands impacts during dredged material disposal.

PUBLIC HEARING TESTIMONY: Ms. Greene has been qualified as an expert witness in wetlands investigation and environmental impact assessment before many Municipal Planning Boards and Environmental Commissions as well as county boards and in Superior Court including the following:

Atlantic County Court
Ocean County Court
Middlesex County Court
NJ Office of Admin. Law
Old Bridge Township, NJ
Raritan Township, NJ
Readington Township, NJ
S.Brunswick Township, NJ
Sparta Township, NJ
Tewksbury Township, NJ
Tinton Falls Borough, NJ
Vernon Township, NJ
White Township, NJ
Woodbridge Township, NJ
New Providence Borough, NJ
Mahwah Township, NJ
Mercer County, NJ
Lawrence Township, NJ
Mt. Olive Township, NJ
Bridgewater Township, NJ
Burlington Township, NJ
Chesterfield Township, NJ
E.Brunswick Township, NJ
Edgemont Township, PA
Helmetta Borough, NJ
Hillsborough Township, NJ
Howell Township, NJ
Independence Township, NJ
Berkeley Hts. Township, NJ

EMPLOYMENT HISTORY:

1986-Present	President, Amy S. Greene Environmental Consultants, Inc.
1980-1986	IT Corporation/Princeton Aqua Science, Edison, New Jersey Project Manager/Environmental Scientist
1975-1980	Pandullo Quirk Associates, Wayne, New Jersey Environmental Scientist
1974-1975	Essex County Park Commission, Center for Environmental Studies, Park Naturalist

AFFILIATIONS:

NJ Audubon Society - Member
Society of Wetland Scientists - Member
Philadelphia Botanical Club - Member
Ecological Society of America - Member
Somerset County Chamber of Commerce - Member
NJ Shore Builders Association - Member
Northwest Builders Association - Representative to State Association Environmental Committee
NJ and National Association of Women Business Owners - Member
NJ Parks and Recreation Association - Member, Wetlands Committee
South Branch Watershed Association - Vice President, Board of Trustees

LOIS E. M. ANDERSON
Project Director

AREAS OF EXPERTISE: Wetlands Ecology, Environmental Impact Assessment, Wetland Delineation in Problem Areas.

EDUCATION: M.S. Biology, 1986, The Pennsylvania State University.

B.A. Biological Sciences, cum laude, 1980, Mount Holyoke College. Environmental, Population and Organismic Biology, Spring 1979, University of Colorado, Boulder.

CERTIFICATES: Certificate of Completion. Wetland Delineation in Problem Areas. Wetland Training Institute. Pikesville, MD - October 1993.

Certificate of Completion. Wetland Functions and Values. Wetland Training Institute. Chincoteague, VA - July 1990.

Certificate of Completion. Jurisdictional Delineation of Wetlands in the Mid-Atlantic States. National Wetland Training Cooperative. New Brunswick, NJ - May 1989.

PROFESSIONAL EXPERIENCE: Ms. Anderson has ten (10) years experience in wetland ecology. She has a strong educational background in aquatic and forest ecology, hydrology, physiological ecology, and environmental resource management. Ms. Anderson has conducted extensive vegetation and wildlife surveys of impacted and unimpacted wetlands. She has performed wetland delineations on a wide variety of sites and is especially skilled in delineating disturbed areas. She has a strong working knowledge of current State and Federal wetland regulations and has experience and training in the use of the 1987 US Army Corps of Engineers and the 1989 Joint Federal Wetland Delineation methodologies.

As Project Director for ASGECI, Ms. Anderson oversees and coordinates work by the field staff on large projects, including project administration. Ms. Anderson performs wetland delineations and wildlife surveys and habitat assessments. She also prepares environmental impact statements, permit applications, and wetland and habitat mitigation plans. She is responsible for reviewing work performed by the field staff for wetland delineations, reports, and permit applications. In addition, she develops and writes project proposals and meets with clients to discuss new projects.

Ms. Anderson has been principally responsible for the performance of the following projects:

Ecology section of AA/DEIS Study, Hudson River Waterfront Transportation Project for NJ Transit, Hudson County, NJ.

Endangered and Threatened Species Inventory and Habitat Management Plan for the Master Plan Update at the Atlantic City International Airport and FAA Technical Center. South Jersey Transportation Authority, Atlantic Co., NJ.

Wetlands delineation and permitting for Gateway Transit Hub, Waterfront Transit Hub Project. NJ Transit, Hudson County, NJ.

Wetlands delineation and wetlands restoration plan for Kearny Connection Project. NJ Transit, Hudson County, NJ.

Wetlands delineation, Individual Freshwater Wetlands Permit application, and mitigation plan for NJ Dept. of Transportation. Interstate RT. 80 C-D Road, Bergen County, NJ.

Wetlands investigation, Endangered and Threatened species impact assessment and habitat mitigation plan, and Pinelands development application for proposed apron expansion at Atlantic City International Airport, Egg Harbor Township, Atlantic County, NJ.

Natural Resource Inventories of wetlands, vegetation and endangered and threatened species for Millstone Township, Monmouth County, NJ and East Amwell Township, Hunterdon County, NJ.

PUBLIC HEARING TESTIMONY:

Ms. Anderson has been qualified as an expert witness in wetlands investigation and environmental impact assessment before the following New Jersey Municipal Planning Boards:

Warren Township
Independence Township
Bernards Township
Tewksbury Township
Hillsborough Township

EMPLOYMENT HISTORY:

7/94-Present: Project Director, Amy S. Greene Environmental Consultants, Inc.

3/90-7/94: Senior Project Manager, Amy S. Greene Environmental Consultants, Inc.

4/89-3/90: Project Manager, ASGECI.

6/87-4/89: Environmental Scientist, ASGECI.

9/86-6/87: Senior Research Technologist, Biotechnology Institute, Pennsylvania State University.

8/86-10/86: Field Assistant, Department of Forestry, Pennsylvania State University.

PRESENTATIONS & PUBLICATIONS:

Guest lecturer. April 1991. Introduction to Wetland Ecology. Continuing Education, Rutgers University, New Brunswick, NJ.

Guest speaker. March 1991. Freshwater Wetlands in New Jersey. Kiwanis Club, Flemington, NJ Chapter.

McHerron L.E., Stevens S.E., Webster H.J., Stark L.R., Dionis K. 1987. Iron removal in a simulated wetland for acid mine drainage treatment. In Eighth Annual Surface Mine Drainage Task Force Symposium, Morgantown, WV. April 7-8, 1987.

McHerron L.E. 1985. The seasonal effectiveness of a Sphagnum wetland in removing iron and manganese from mine drainage. p. 385. In Wetlands and Water Management on Mined Lands. R.P. Brooks, D.E. Samuel, J.B. Hills (eds.). Penn State University.

Burris J.E., Gerber D.W., McHerron L.E. 1984. Removal of iron and manganese from water by Sphagnum moss. pp. 1-13. In Treatment of Mine Drainage by Wetlands, J.E. Burris (ed.). Pennsylvania State University, University Park, Contribution No. 264 Dept. of Biology.

AFFILIATIONS:

Society of Wetland Scientists
The Nature Conservancy
New Jersey Audubon Society

LISA J. BRAVE
Project Manager

AREA OF EXPERTISE:

Wetlands Delineation and Permitting, Environmental Impact Assessment, Wildlife Habitat Assessment, Environmental Site Assessment, Level of Action Assessment

EDUCATION:

B.S. Natural Resources (Wildlife Management), The Ohio State University, 1985.

CERTIFICATES/ PROFESSIONAL COURSES:

Certification as a Professional Wetland Scientist - Society of Wetland Scientists

Appointed Member - White Township Environmental Commission

Certificate of Completion, 40-Hour OSHA Health and Safety Training Course for Hazardous Site Workers

EPA-AHERA Certified Asbestos Inspector

Cook College, Rutgers University:

- Environmental Enforcement: NJDEP Policy
- Freshwater Wetlands, Permitting
- Understanding Soil Conditions in Wetlands
- Wetland Systems of the Northeast
- Planning for NJ Wetlands, Wetlands of NJ
- Vegetation Identification for Wetlands Delineation , Spring/Summer/Fall Conditions
- Vegetation Identification for Wetlands Delineation, Winter Conditions

PROFESSIONAL EXPERIENCE:

Ms. Brave has over eight years experience working in the environmental field. She has a strong background in the environmental consulting field and specifically in wetlands delineations, wetlands permitting, environmental site assessments and environmental impact assessments. She has an excellent working knowledge of current State and Federal wetlands regulations and has experience and training in the use of the 1987 US Army Corps of Engineers and 1989 Joint Federal Wetland Delineation methodologies.

As Project Manager for ASGECI, Ms. Brave is responsible for performing and coordinating all work on assigned projects including: field investigations, wetland delineations, hydrologic and soils investigations, wildlife studies, environmentally sensitive areas mapping, impact assessments, report preparation, regulatory agency submissions, and the interaction with clients as well as local, State, and Federal governmental agencies

Ms. Brave has been principally responsible for the performance of the following projects:

Performed wetlands delineations, prepared NEPA Environmental Impact Assessment and obtained permits for Paterson Plank Road/Routes 1 and 9 roadway improvements, for NJ Dept. of Transportation and Federal Highway Authority, Towns of North Bergen and Secaucus, Bergen County.

Wildlife and Rare Species Habitat Assessment, Wetlands Delineations, CAFRA Environmental Impact Statement, and NJDEP Freshwater Wetlands and Pinelands Permitting, Garden State Parkway Interchanges 40 and 44 and ETC toll plaza for the New Jersey Highway Authority, Townships of Port Republic and Galloway, Atlantic County, New Jersey.

Wetlands delineations and NJDEP Individual Wetlands Permit application for the Township of Rockaway in accordance with the NJ Freshwater Wetlands Protection Act for drainage improvements at McKeel's Brook in Rockaway Township, Morris County, NJ.

Obtained NJDEP approval of a Wetlands Transition Area Averaging Plan prepared in accordance with the NJ Freshwater Wetlands Protection Act for the Franklin Township Board of Education, Franklin Township, Hunterdon County, New Jersey.

Performed wetlands delineations and obtained Statewide General Permits and Transition Area Averaging Plan approval for the Morris County Vocational Technical School in the Township of Denville, Morris County, New Jersey.

Ecological Assessment for environmentally sensitive areas for the Robert Wood Johnson, Forrestal Center property in South Brunswick, Middlesex County, New Jersey.

Level of Action Assessments: Coordinated all sections, performed field studies for, and wrote Wildlife, Wetlands, Hazardous Waste, Noise and Air Quality sections for the NJ Department of Transportation - Bureau of Environmental Assessment. Work involved many sites throughout New Jersey.

Prepared applications for Statewide General Permits for the NJDOT for their Newark Regional Headquarters facility. The application packages were prepared on an emergency basis, and completed within 48 hours. Follow-up with the NJDEP allowed for receipt of the permits within one week of application.

In addition to numerous wetlands delineations and permit preparations, Ms. Brave has also coordinated, managed and performed numerous Phase I Environmental Site Assessments in New Jersey, New York, Ohio and Florida. She has performed ECRA/ISRA investigations, media sampling, and has managed the removal of underground storage tank systems throughout New Jersey.

EMPLOYMENT HISTORY:

1/95-Present:	Project Manager, Amy S. Greene Environmental Consultants, Inc.
3/92-1/95:	Project Manager, Environmental Specialist, The RBA Group, Morristown, NJ.
3/91-3/92:	Senior Staff Scientist, Bell Environmental Consultants, Dover, NJ.
6/89-2/91:	Environmental Specialist, Environmental Connection, Inc., Freehold, NJ.
9/87-6/89:	Environmental Specialist, TRC Environmental Consultants, Inc., Somerset, NJ.

AFFILIATIONS:

National Wildlife Federation
Society of Wetland Scientists
White Township Environmental Commission

MARGARET BRANCHEAU
Project Manager

AREAS OF EXPERTISE: Wildlife Surveys, Vegetation Surveys, Behavioral Observation of Wildlife, Wetland Investigations.

EDUCATION: B.S., Environmental Studies Biology, 1987, Millersville University of Pennsylvania.

CERTIFICATIONS & PROFESSIONAL COURSES: Habitat Evaluation Procedures Certification, USFWS/Colorado State University - May, 1993.

Hydric Soils, Office of Continuing Education, Cook College, Rutgers University - October, 1994.

PROFESSIONAL EXPERIENCE: As an Environmental Scientist for Amy Greene Environmental Consultants, Inc., Ms. Brancheau performs wetland delineations and wildlife surveys, and prepares wetland delineation, endangered and threatened species, and environmental impact reports. She has prepared numerous applications for NJDEP wetland permits and letters of interpretation.

Ms. Brancheau has been involved in wildlife observation and documentation over the past seven (7) years. She conducted a vegetational survey on the Lois Howe Nature Trail for the Somerset County Parks Commission which included mapping, bird survey, and terrestrial wildlife observation. She monitored the common loon population on a 2,500 square mile area in New Hampshire. Ms. Brancheau was involved in two pesticide studies which involved small mammal and bird surveys, nest monitoring, residue collections, habitat identification, vegetational surveys, and observation of wildlife for pesticide-induced behavior patterns. The study sites were located in the Finger Lakes area of New York and the coastal region of North Carolina.

Ms. Brancheau has been principally or partially responsible for the following projects:

Endangered and threatened species report and habitat-type mapping for the proposed 3,000 acre Disney's America site in Prince William County, VA.

Endangered and threatened species and general wildlife survey with impact assessment for Princeton Airport Expansion Environmental Impact Study, Montgomery Township, Somerset County, NJ. Endangered and threatened species surveyed included wood turtles, grasshopper sparrows and barred owls.

Environmental Impacts Evaluation of a 977 acre Superfund site within the New Jersey Pinelands. Included was wetland delineation and a survey of Endangered and Threatened species such as timber rattlesnake, Pine Barrens treefrog, pine snake, corn snake, and barred owl as well as evaluation of potential habitat.

Wildlife section of Environmental Assessment for additions and renovations at Kean College, Union, NJ.

Endangered and Threatened species investigation for Atlantic City Airport Master Plan, Pomona, NJ. This project mainly involved grasshopper sparrows and upland sandpipers.

Search for wood turtles and assessment of habitat suitability, wetlands delineation and documentation and Individual Freshwater wetlands permit application for NJDOT for Route 130/Adams Lane in Middlesex County, NJ.

Wetlands delineation for Route 287 High Occupancy Vehicle lane expansion, NJDOT, Morristown, NJ.

Grasshopper sparrow population/habitat study, Atlantic City International Airport, Pomona, NJ.

Wildlife survey at proposed septic system construction area for AT&T in Holmdel, NJ.

Wetlands delineation and report for proposed Snake Den Road Bridge replacement, NJDOT, West Milford, NJ.

Wildlife inventory as part of Environmental Assessment, Manorfield Development, Bernards Township, NJ.

Wildlife inventory as part of Environmental Assessment, Warren Springs Development, Warren Township, NJ.

EMPLOYMENT HISTORY:

3/94-present	Project Manager, Amy S. Greene Environmental Consultants, Inc.
2/92-3/94	Environmental Scientist, Amy S. Greene Environmental Consultants, Inc.
3/91-10/91	Field Biologist/Ornithologist, Wildlife International, Ltd.
5/90-9/90	Field Ornithologist, Audubon Society of New Hampshire.

5/85-8/85 and 5/86-8/86	Park Naturalist/Ranger, Somerset County Parks Commission

AFFILIATIONS:

National Audubon Society
New Jersey Audubon Society
Audubon Society of New Hampshire
The Nature Conservancy
New Jersey Conservation Foundation
South Branch Watershed Association

WILLIAM H. SMEJKAL
Project Manager/Geologist

AREAS OF EXPERTISE: Geology, Wetlands Ecology, Soils, Herpetology, Environmental Impact Assessment, Permit Preparation

EDUCATION: M.S. Geological Science, December 1992, Rutgers University, Newark, New Jersey.

B.S. Biology, May 1976, Ramapo College, Mahwah, New Jersey.

PROFESSIONAL COURSES:

Delaware Valley College Herpetology Program, spring 1995.

NJ Association of Professional Soil Scientists Meeting. Stockton, NJ - October 1990.

Identification of Sedges and Rushes. Continuing Education, Cook College, Rutgers University - August 1990.

Wetlands Delineation. National Wetland Training Institute - July 1990.

The New Jersey Pinelands, Our Country's First National Reserve. Cook College, Rutgers University - March 1990.

Geology and Hydrogeology of New Jersey. Continuing Education, Cook College, Rutgers University - October 1989.

Understanding Soil Conditions of Wetlands. Continuing Education, Cook College, Rutgers University - April 1989.

The Permit Seminar. NJ Department of Environmental Protection and Rutgers University, Jamesburg, NJ - February 1989.

Planning for New Jersey's Freshwater Wetlands: Ecology and Regulations. Cook College, Rutgers University, - January 1989.

PROFESSIONAL EXPERIENCE: Mr. Smejkal has a strong background in Biology and Wetlands Ecology as well as over eight years experience in the bedrock geology and soils of the Northeastern United States. As Project Manager for Amy S. Greene Environmental Consultants, Inc., Mr. Smejkal is responsible for all aspects of wetlands investigations. These include: wetlands delineations, wildlife studies, hydrology and soils investigations, preparation of wetlands reports and environmental impact assessments, and interaction with governmental agencies.

Mr. Smejkal has been principally responsible for the performance of the following projects:

Environmental Impacts Evaluation of a 977 acre Superfund site within the New Jersey Pinelands. Included was a survey of Endangered and Threatened species such as timber rattlesnakes, Pine Barrens treefrog, pine snake, corn snake, bog turtles, and barred owl as well as evaluation of potential habitat.

Environmentally Sensitive Areas Assessment for developers in Montville Township, Morris County, NJ. Included was an analysis of wetlands and steep slopes and a wood turtle survey.

Wetlands delineation of a 300-acre parcel in Bridgewater Township, Somerset County, NJ. This project included extensive early spring searches for wood turtles to confirm reported sightings.

Wetland delineation and documentation of wood turtle occurrence on 83 acre site in Morris County.

Water quality sampling of three streams for 500 acre mixed development project in South Brunsick, Middlesex County.

Aquifer study in Hudson County including the Palisades diabase, Brunswick and Stockton formations and overlying sediments. Movement of contaminants in groundwater due to overpopulation was also addressed.

Wetland delineation of 450+ acre research/office complex in Monmouth County.

Wood turtle survey on 116 acre site of proposed residential development in Somerset County.

Preparation of a restoration plan including establishing previous wetland boundary, fill removal and replanting, and monitoring plan for the recovery and rehabilitation of a wetland in Morris County.

Preparation of a Statement of Compliance and application for a Waterfront Development Permit for an industrial complex in Woodbridge, Middlesex County.

Wetland delineation for proposed office and industrial park in Freehold Township, Monmouth County, NJ.

Wetland delineation and Letter of Interpretation application for proposed expansion of industrial building in Woodbridge Township, Middlesex County, NJ.

Hydrologic investigation of ground water drawdown and subsequent changes in vegetation in Marlboro Township, Monmouth County, NJ.

Wetland delineation and habitat evaluation for endangered and threatened species in Bergen and Monmouth County, NJ.

Environmental Impact Assessment in Randolph Township, Morris County, NJ. Wetlands delineation and endangered and threatened species assessment including documentation of wood turtle occurrence.
Colts Neck, Monmouth County, NJ. Wetland delineation and aquifer study for presentation to Township Environmental Council.

EMPLOYMENT HISTORY:

11/88-Present	Project Manager, Amy S. Greene Environmental Consultants, Inc.
2/87-11/88:	Geologist, Norman J. Coons, Inc., Consulting Engineers.
9/85-9/87:	Paleontological Research, Lamont-Doherty Geological Observatory of Columbia University.

AFFILIATIONS:

American Association for the Advancement of Science
Geological Association of New Jersey
Geological Society of America
World Wildlife Fund
Nature Conservancy

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.

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WOOD TURTLE SURVEY

FOR

NEW JERSEY TURNPIKE AUTHORITY
PROPOSED ROUTE 92

SOUTH BRUNSWICK AND PLAINSBORO TOWNSHIPS
MIDDLESEX COUNTY, NEW JERSEY

JULY 15, 1996

Submitted to:

FREDERIC R. HARRIS, INC.

Prepared by:

AMY S. GREENE ENVIRONMENTAL
CONSULTANTS, INC.

Project #1244A

EXECUTIVE SUMMARY

A wood turtle survey was performed as a supplement to the Wildlife Inventory Report (Amy S. Greene Environmental Consultants, Inc., 1996) for proposed Route 92, at the request of the New Jersey Department of Environmental Protection (NJDEP). The purpose of the survey was to determine whether wood turtles are present within the vicinity of the proposed right-of-way for Route 92. The survey consisted of field searches for wood turtles and evaluation of wood turtle wintering habitat along the Devil's Brook corridor between Lake McCormack and East New Road.

The majority of the area surveyed was determined to be flooded forest and did not provide the necessary components for wood turtle wintering habitat. Upland/wetland transition areas were also searched for wood turtles. No evidence of wood turtles was discovered. It is highly unlikely that wood turtles utilize the searched corridor from November through March.

TABLE OF CONTENTS

I. INTRODUCTION

A Wildlife Inventory Report (WIR) dated February 5, 1996 was prepared by Amy S. Greene Environmental Consultants, Inc. (ASGECI) for the proposed Route 92 project. The WIR was reviewed by the New Jersey Department of Environmental Protection (NJDEP) Land Use Regulation Program, NJDEP Division of Fish, Game and Wildlife and NJDEP Office of Program Coordination submitted as Appendix B of the Route 92 Executive Order No. 215 Response Document dated February 1996. The proposed Route 92 traverses wetland and upland forest, upland and agricultural fields and wet meadows. The central portion of the alignment crosses Devil's Brook.

It was determined in the WIR (ASGECI, 1996) that the area within 300 feet of where the alignment crosses Devil's Brook did not provide necessary wintering habitat for wood turtles, due to the lack of defined bed and banks in this area. However, at a March 14, 1996, meeting the NJDEP Division of Fish, Game and Wildlife and Land Use Regulation Program requested that additional studies be performed to examine whether adequate wintering habitat exists further up- or downstream from the alignment. If wintering habitat were available, any existing wood turtles could migrate to the project ROW for breeding, nesting, resting or feeding, since there is such habitat within the immediate vicinity of the alignment. Therefore, additional surveys were performed along Devil's Brook during the spring of 1996 (April and May), encompassing a more expansive area, to determine whether wood turtles exist within the vicinity of the proposed right-of-way (ROW) for Route 92.

The additional survey consisted of two phases. The first phase consisted of walking the Devil's Brook corridor to determine which areas, if any, had the potential for wood turtle wintering habitat, while at the same time surveying the area for wood turtles. The second phase consisted of searching areas of potential habitat for wood turtles. The survey was discussed and verbally accepted by the NJDEP (Jim Sciascia, personal communication, April 2 and May 17, 1996). This report explains the survey methodology utilized and presents and discusses the results obtained.

II. HABITAT INFORMATION

Wood turtles require both aquatic and terrestrial habitat (NJDEP, 1993). They tend to be aquatic from approximately mid-November to mid-March, terrestrial from mid-May to mid-September, and in transition the remainder of the year. They are very difficult to find in the summer, after they have migrated from the streams, as they hide in dense grass

and underbrush. Streams and rivers are used primarily for breeding and hibernating. They prefer slow meandering streams with sandy bottoms and shoals for breeding in the spring and sometimes in the fall. In the winter, they hibernate within the banks or on the bottom of streams or rivers.

In New Jersey, mating was found to nearly always occur in streams with water levels from 30 cm to 100 cm (approximately 1 to 3 feet) in depth (Farrell and Zappalorti, 1980). Wood turtles will nest in any number of habitats, including agricultural fields (Zappalorti et al., 1984).

Zappalorti and Johnson (1980) found that wood turtles tend to live side by side with brook trout, highlighting their requirements for pure, unpolluted water. Zappalorti and Farrell (1984) found that wood turtles were usually found to be associated with a water system that had an abundant fish population, especially an area that was stocked annually with trout. Another common denominator of wood turtle populations is their proximity to large tracts of undisturbed fields and forest, used for nesting and foraging (Zappalorti and Johnson, 1981), usually separated from populated, residential areas or major highways by at least one-half mile or more (Zappalorti and Farrell, 1984).

Although home range is not yet clearly defined, it is known that wood turtles can travel long distances from their wintering site. There are several reports of recaptured turtles found from one-half to one mile from original capture points near winter hibernacula.

III. METHODOLOGY

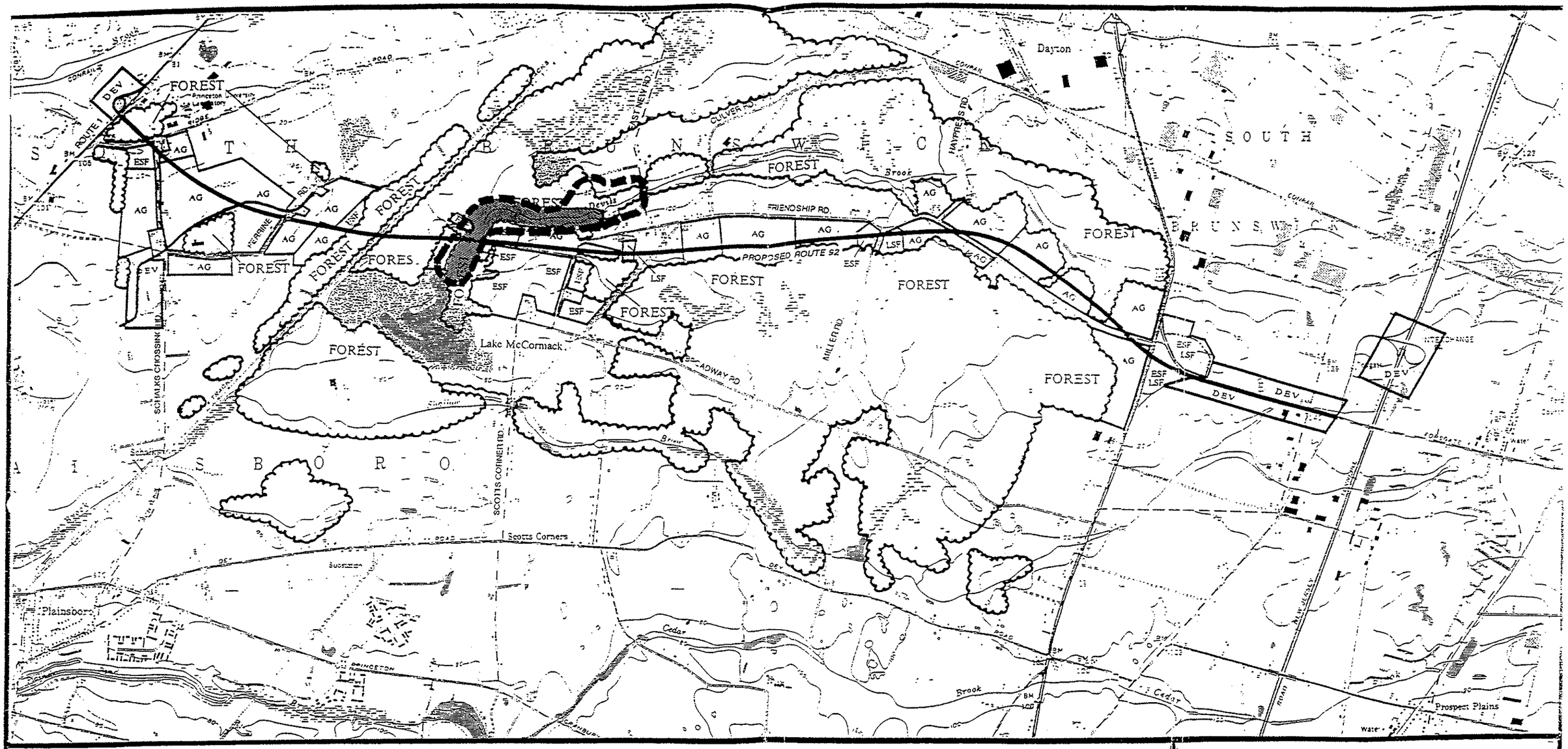
Forested wetlands along Devil's Brook and adjacent forested and open areas were searched for wood turtles (Figure 1). April through June is the best time to search for wood turtles, due to their expected movement between stream corridor (winter hibernacula habitat), open fields (nesting habitat), and woodland (summer feeding/resting habitat) at that time.

Our scope of work proposed a search area of 1000 feet on either side of the proposed Route 92 alignment at the intersection of the roadway with Devil's Brook, located east of the Amtrak rail line, and was verbally accepted by NJDEP staff (Jim Sciascia, personal communication, April 2, 1996). This survey was to include six search days from mid-April to mid-May on days when the temperature exceeded 70 degrees F. The first phase of the survey (two days) was to identify the nature and extent of potential habitat within the study area. If only a portion of the study area contained the

undercut banks typical of winter hibernacula, then only those areas remained in the search area. Remaining survey time (four days) could then be used for searches of the upland/wetland boundary and adjacent fields later in May. If no areas of suitable wintering habitat were observed, then coordination with NJDEP to discuss the feasibility of continuing the survey would be pursued.

The habitat was evaluated within the 2000 foot corridor in early to mid-May. Air temperature was not a concern during the first day since the primary purpose was to evaluate the habitat, not to look for wood turtles. Stream banks, where present, were examined for overhangs, exposed roots, muskrat burrows, or any other feature which could potentially be utilized for wood turtle hibernacula. Over two days, an area of approximately 50 to 100 feet wide, on either side of the brook was walked in separate zigzag patterns by two field personnel. Sticks were used to move vegetation that turtles might use for cover, to poke under undercut banks and roots, and to check water depths. No suitable wintering habitat was observed within the 2000 foot corridor. Therefore, we extended the search area further upstream to include the portion of Devil's Brook up to East New Road (Figure 1). The stream extending 1000 feet west of East New Road was found to have bed and banks. Table 1 presents the dates and locations of field surveys.

Due to the lack of suitable habitat in the majority of the study area observed during the first phase of the survey and some cold spring weather, it was decided that it would be more productive to search the transition areas and adjacent uplands during the end of May and/or beginning of June (Jim Sciascia, personal communication, May 17, 1996). This is the time when turtles would be expected to be moving into these areas. The second phase of the survey continued through June and focused on the area near East New Road that had bed and banks. It was verbally agreed upon between ASGECI and NJDEP staff that only three additional days of survey were necessary, instead of the four originally proposed. Searches were generally conducted between the hours of 9:30 a.m. and 1:00 p.m. The search methodology used was the same as that described above. The two field ecologists performed searches of transition areas associated with Devil's Brook and adjacent upland fields 100 feet or more from the wetland boundary from East New Road to the west approximately 1000 feet.



LEGEND:

AG	AGRICULTURAL FIELDS
ESF	EARLY SUCCESSIONAL FIELD
DEV	DEVELOPED LAND
LSF	LATE SUCCESSIONAL FIELD
	FOREST BOUNDARIES
	FIELD BOUNDARIES
	PROPOSED ROUTE 92

BOUNDARY OF STUDY AREA

FLOODED FOREST

NOTE: Habitat types were determined from the review of current aerial photographs and field verification by Amy S. Greene Environmental Consultants, Inc.

SOURCE: USGS 7.5 Minute Topographic Series Map, Hightstown and Jamesburg, NJ Quadrangles.

0 2500'

FIGURE 1
LOCATION OF STUDY AREA
FOR WOOD TURTLE SURVEY

Proposed Route 92
South Brunswick & Plainsboro Townships
Middlesex County, New Jersey

ASGECI Project #1244A

AMY S. GREENE
ENVIRONMENTAL CONSULTANTS, INC.

TABLE 1 – SURVEY DATES AND CONDITIONS

SURVEYS	CONDITIONS	AREA SEARCHED
May 8, 1996	Rainy/ 50–70 F	Stream Corridor and Wetlands From McCormack Lake to Channelized Portion of Devil's Brook.*
May 15, 1996	Sunny/ >70 F	Stream Corridor and Wetlands From Channelized Portion of Devil's Brook to East New Road.
May 15, 1996	Sunny/ >70 F	Transition Areas and Adjacent Fields Between Channelized Portion of Devil's Brook and East New Road.
June 7, 1996	Sunny/ >70 F	New Road to Flooded Forest Section.** Transition Areas and Adjacent Fields
June 19, 1996	Rainy/ >70 F	New Road to Flooded Forest Section. Transition Areas and Adjacent Fields

* Channelized portion of Devil's Brook is located just north of proposed Route 92 Right–of–Way above Lake McCormack (Figure 1).

** Flooded Forest Section includes the area of Devil's Brook from Lake McCormack to approximately 1,000 feet west of New Road (Hatched Area, Figure 1).

IV. RESULTS AND CONCLUSIONS

The results of the first phase of the wood turtle survey indicated that there is minimal potential wintering habitat within the surveyed corridor. Only one area along Devil's Brook, from East New Road to approximately 1000 feet west of East New Road, exhibited defined bed and banks; however, few undercut banks were observed. The remainder of the corridor consisted of flooded forest with no distinguishable bed and banks along Devil's Brook. In the area within 1000 feet of the proposed Route 92 ROW crossing Devil's Brook, the area was primarily a flooded forest in which the trees were on hummocks and the stream channel was mostly undefined (Figure 1). There were no overhanging banks typical of wood turtle winter habitat. Because most of the Devil's Brook corridor within the area surveyed consists of flooded forest without a distinct stream channel, it does not provide the undercut banks that typify the turtle's hibernacula. Because there is minimal potential winter hibernacula habitat within the surveyed corridor, it is unlikely that wood turtles are utilizing this area for wintering.

No wood turtles were found during the survey. While other wildlife surveys such as for the grassland birds and the barred owl surveys were being performed, observations were also made for evidence of wood turtles. No evidence of the wood turtle was found during these other surveys. Wood turtles are reported to travel up to a mile from their wintering habitat. Although there is an extensive amount of potential feeding and nesting habitat throughout the proposed Route 92 corridor, wood turtles need to have a wintering hibernacula within a mile of these areas in order to utilize this habitat. Since it appears that there is minimal suitable wintering habitat within this distance of the proposed ROW, it is unlikely that wood turtles would be utilizing the area within the immediate vicinity of the ROW from November through March.

In addition to our own findings, Mr. Larry Torok of the NJDEP, Land Use Regulation Program, who has made limited field surveys of the forested habitat surrounding Devil's Brook, stated that the habitat in the area is not ideal for wood turtles (personal communication, October 1995 and May 1996).

V. LIST OF REFERENCES

Conant, R. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston, MA.

Farrell, R.F. and Zappalorti, R.T. 1979 and 1980. An Ecological Study of the Wood Turtle, Clemmys insculpta, Le Conte, (Reptilia, Testudines, Emyididae) in Northern New Jersey, Parts I and II. Herpetological Associates, Staten Island, NY.

NJDEP, Division of Fish, Game and Wildlife. 1990. New Jersey DFG&W Database - Turtle, wood.

NJDEP, Division of Water Resources. 1984. Delineation of the Floodway and Flood Hazard Area, Devils Brook, South Brunswick Township, Middlesex County, Sheets 48 and 49.

NJDEP, Endangered and Nongame Species Program and USDA Soil Conservation Service. 1980. Endangered and Threatened Species of New Jersey.

NJDEP, Endangered and Nongame Species Program. 1987. Annual Report.

NJDEP, Land Use Regulation Program. 1994. Notice of the Opportunity for Public Comment on the Criteria used for Establishing Exceptional Resource Value Wetland Classifications Based on Endangered and Threatened Species Locational Data (Draft). Trenton, NJ.

NJDEP, Natural Heritage Program. 1995. Natural Heritage Database Correspondence (unpublished letter). Trenton, NJ.

NJDEP, Office of Natural Lands Management. 1992. Special Animals of NJ. Division of Parks and Forestry, Trenton, NJ.

Sciascia, J. 1996. Personal communications with Lisa Brave, Amy S. Greene Environmental Consultants, Inc.

Torok, L. 1992. Wetlands and Wildlife Habitat. In: Freshwater Wetlands Identification and Regional Conference Proceedings, September 22-23 1992. Sponsored by NJ Division of American Foresters, Rutgers Cooperative Extension and U.S. Forest Service.

Torok, L. 1995 and 1996. Personal communications with Lisa Brave, Amy S. Greene Environmental Consultants, Inc.

Zappalorti, R.T. and E.W. Johnson. 1980. Additional Updated Locality and Distribution Records of Endangered and Threatened Amphibians and Reptiles in New Jersey (Third Supplement). Unpublished report to NJDEP, Division of Fish, Game, and Wildlife, Endangered and Nongame Species Program by Herpetological Associates, Staten Island, NY.

Zappalorti, R.T. and E.W. Johnson. 1981. Proposed Management Plans for Endangered and Threatened Amphibians and Reptiles in New Jersey. Unpublished report to NJDEP, Division of Fish, Game, and Wildlife, Endangered and Nongame Species Program by Herpetological Associates as quoted in NJDEP letter dated February 9, 1993.

Zappalorti, R.T., R. Farrell and P.A. Reap. 1984. The Ecology of the Wood Turtle, Clemmys insculpta in New Jersey, Part III. Herpetological Associates, Inc., Staten Island, New York.

APPENDIX A

QUALIFICATIONS OF PREPARERS

LOIS E. M. ANDERSON
Project Director

AREAS OF EXPERTISE: Wetlands Ecology, Environmental Impact Assessment, Wetland Delineation in Problem Areas.

EDUCATION: M.S. Biology, 1986, The Pennsylvania State University.

B.A. Biological Sciences, cum laude, 1980, Mount Holyoke College. Environmental, Population and Organismic Biology, Spring 1979, University of Colorado, Boulder.

CERTIFICATES: Certificate of Completion. Wetland Delineation in Problem Areas. Wetland Training Institute. Pikesville, MD - October 1993.

Certificate of Completion. Wetland Functions and Values. Wetland Training Institute. Chincoteague, VA - July 1990.

Certificate of Completion. Jurisdictional Delineation of Wetlands in the Mid-Atlantic States. National Wetland Training Cooperative. New Brunswick, NJ - May 1989.

PROFESSIONAL EXPERIENCE: Ms. Anderson has ten (10) years experience in wetland ecology. She has a strong educational background in aquatic and forest ecology, hydrology, physiological ecology, and environmental resource management. Ms. Anderson has conducted extensive vegetation and wildlife surveys of impacted and unimpacted wetlands. She has performed wetland delineations on a wide variety of sites and is especially skilled in delineating disturbed areas. She has a strong working knowledge of current State and Federal wetland regulations and has experience and training in the use of the 1987 US Army Corps of Engineers and the 1989 Joint Federal Wetland Delineation methodologies.

As Project Director for ASGECI, Ms. Anderson oversees and coordinates work by the field staff on large projects, including project administration. Ms. Anderson performs wetland delineations and wildlife surveys and habitat assessments. She also prepares environmental impact statements, permit applications, and wetland and habitat mitigation plans. She is responsible for reviewing work performed by the field staff for wetland delineations, reports, and permit applications. In addition, she develops and writes project proposals and meets with clients to discuss new projects.

Ms. Anderson has been principally responsible for the performance of the following projects:

Ecology section of AA/DEIS Study, Hudson River Waterfront Transportation Project for NJ Transit, Hudson County, NJ.

Endangered and Threatened Species Inventory and Habitat Management Plan for the Master Plan Update at the Atlantic City International Airport and FAA Technical Center. South Jersey Transportation Authority, Atlantic Co., NJ.

Wetlands delineation and permitting for Gateway Transit Hub, Waterfront Transit Hub Project. NJ Transit, Hudson County, NJ.

Wetlands delineation and wetlands restoration plan for Kearny Connection Project. NJ Transit, Hudson County, NJ.

Wetlands delineation, Individual Freshwater Wetlands Permit application, and mitigation plan for NJ Dept. of Transportation. Interstate RT. 80 C-D Road, Bergen County, NJ.

Wetlands investigation, Endangered and Threatened species impact assessment and habitat mitigation plan, and Pinelands development application for proposed apron expansion at Atlantic City International Airport, Egg Harbor Township, Atlantic County, NJ.

Natural Resource Inventories of wetlands, vegetation and endangered and threatened species for Millstone Township, Monmouth County, NJ and East Amwell Township, Hunterdon County, NJ.

PUBLIC HEARING TESTIMONY:

Ms. Anderson has been qualified as an expert witness in wetlands investigation and environmental impact assessment before the following New Jersey Municipal Planning Boards:

Warren Township
Independence Township
Bernards Township
Tewksbury Township
Hillsborough Township

EMPLOYMENT HISTORY:

7/94-Present: Project Director, Amy S. Greene Environmental Consultants, Inc.

3/90-7/94: Senior Project Manager, Amy S. Greene Environmental Consultants, Inc.

4/89-3/90: Project Manager, ASGECI.

6/87-4/89: Environmental Scientist, ASGECI.

9/86-6/87: Senior Research Technologist, Biotechnology Institute, Pennsylvania State University.

8/86-10/86: Field Assistant, Department of Forestry, Pennsylvania State University.

PRESENTATIONS & PUBLICATIONS:

Guest lecturer. April 1991. Introduction to Wetland Ecology. Continuing Education, Rutgers University, New Brunswick, NJ.

Guest speaker. March 1991. Freshwater Wetlands in New Jersey. Kiwanis Club, Flemington, NJ Chapter.

McHerron L.E., Stevens S.E., Webster H.J., Stark L.R., Dionis K. 1987. Iron removal in a simulated wetland for acid mine drainage treatment. In Eighth Annual Surface Mine Drainage Task Force Symposium, Morgantown, WV. April 7-8, 1987.

McHerron L.E. 1985. The seasonal effectiveness of a Sphagnum wetland in removing iron and manganese from mine drainage. p. 385. In Wetlands and Water Management on Mined Lands. R.P. Brooks, D.E. Samuel, J.B. Hills (eds.). Penn State University.

Burris J.E., Gerber D.W., McHerron L.E. 1984. Removal of iron and manganese from water by Sphagnum moss. pp. 1-13. In Treatment of Mine Drainage by Wetlands, J.E. Burris (ed.). Pennsylvania State University, University Park, Contribution No. 264 Dept. of Biology.

AFFILIATIONS:

Society of Wetland Scientists
The Nature Conservancy
New Jersey Audubon Society

LISA J. BRAVE
Project Manager

AREA OF EXPERTISE: Wetlands Delineation and Permitting, Environmental Impact Assessments, Wildlife Habitat Assessments, Environmental Site Assessments, Level of Action Assessments.

EDUCATION: B.S. Natural Resources (Wildlife Management), The Ohio State University, 1985.

CERTIFICATES/ PROFESSIONAL COURSES:

Professional Wetland Scientist - Society of Wetland Scientists

Certificate of Completion, 40-Hour OSHA Health and Safety Training Course for Hazardous Site Workers

EPA-AHERA Certified Asbestos Inspector

Cook College, Rutgers University:
- Environmental Enforcement: NJDEP Policy
- Freshwater Wetlands, Permitting
- Understanding Soil Conditions in Wetlands
- Wetland Systems of the Northeast
- Planning for NJ Wetlands, Wetlands of NJ
- Vegetation Identification for Wetlands Delineation, (Spring/Summer/Fall)
- Vegetation Identification for Wetlands Delineation, Winter Conditions

PROFESSIONAL EXPERIENCE: Ms. Brave has over eight years experience working in the environmental field. She has a strong background in the environmental consulting field and specifically in wetlands delineations, wetlands permitting, environmental site assessments and environmental impact assessments. She has an excellent working knowledge of current State and Federal wetlands regulations and has experience and training in the use of the 1987 US Army Corps of Engineers and 1989 Joint Federal Wetland Delineation methodologies.

As Project Manager for ASGECI, Ms. Brave is responsible for performing and coordinating all work on assigned projects including: field investigations, wetland delineations, hydrologic and soils investigations, wildlife studies, environmentally sensitive areas mapping, impact assessments, report preparation, regulatory agency submissions, and the interaction with clients as well as local, State, and Federal governmental agencies.

Ms. Brave has been principally responsible for the performance of the following projects:

Wetlands delineation, NEPA Environmental Impact Assessment and obtained permits for Paterson Plank Road/Routes 1 and 9 roadway improvements, for NJ Dept. of Transportation and Federal Highway Authority, Towns of North Bergen and Secaucus, Bergen County.

Wildlife and rare species habitat assessment, wetlands delineations, CAFRA Environmental Impact Statement, and NJDEP Freshwater Wetlands and Pinelands permitting (obtained all permits), Garden State Parkway Interchanges 40 and 44 and ETC toll plaza for the New Jersey Highway Authority, Townships of Port Republic and Galloway, Atlantic County, New Jersey.

Wetlands delineation and NJDEP Individual Wetlands Permit application in accordance with the NJ Freshwater Wetlands Protection Act for the Township of Rockaway for drainage improvements at McKeel's Brook in Rockaway Township, Morris County, NJ.

Prepared and obtained NJDEP Wetlands Transition Area Averaging Plan in accordance with the NJ Freshwater Wetlands Protection Act for the Franklin Township Board of Education, Franklin Township, Hunterdon County, New Jersey.

Wetlands Delineation, obtained Statewide General Permits and Transition Area Averaging Plan in accordance with the NJ Freshwater Wetlands Protection Act for the Morris County Vocational Technical School in the Township of Denville, Morris County, New Jersey.

Ecological Assessment for environmentally sensitive areas for the Robert Wood Johnson, Forrestal Center property in South Brunswick, Middlesex County, New Jersey.

Level of Action Assessments: Coordinated all sections, performed field studies for, and wrote wildlife, wetlands, hazardous waste, noise and air quality sections for the NJ Department of Transportation - Bureau of Environmental Assessment. Work involved many sites throughout New Jersey.

Wildlife and Endangered and Threatened Species Habitat Assessment for Frederic R. Harris and the NJ Turnpike Authority proposed Route 92, prepared as a supplement for the EIS, as required by the NJDEP Division of Fish, Game and Wildlife. Six of the twenty-three NJDEP Species of Concern were determined to be potentially present within one mile of the project area. Recommendations for minimizing impacts to these and general wildlife species were suggested.

Applications for Statewide General Permit Numbers 6 and 7 were prepared for the NJDOT for their Newark Regional Headquarters facility. Because free fill material was available for only a limited time, the application packages were prepared on an emergency basis and completed within forty-eight hours. Follow-up with the NJDEP allowed for receipt of the permits within one week of application.

In addition to numerous wetlands delineations and permit preparations, Ms. Brave has also coordinated, managed and performed numerous Phase I Environmental Site Assessments in New Jersey, New York, Ohio and Florida. She has performed ECRA/ISRA investigations, media sampling, and has managed the removal of underground storage tank systems throughout New Jersey.

EMPLOYMENT HISTORY:

1/95-Present:	Project Manager, Amy S. Greene Environmental Consultants, Inc.
3/92-1/95:	Project Manager, Environmental Specialist, The RBA Group, Morristown, NJ.
3/91-3/92:	Senior Staff Scientist, Bell Environmental Consultants, Dover, NJ.
6/89-2/91:	Environmental Specialist, Environmental Connection, Inc., Freehold, NJ.
9/87-6/89:	Environmental Specialist, TRC Environmental Consultants, Inc., Somerset, NJ.

AFFILIATIONS:

National Wildlife Federation
Society of Wetland Scientists
Appointed Member of the White Township Environmental Commission

WILLIAM H. SMEJKAL
Project Manager/Geologist

AREAS OF EXPERTISE: Geology, Wetlands Ecology, Soils, Herpetology, Environmental Impact Assessment, Permit Preparation

EDUCATION: M.S. Geological Science, December 1992, Rutgers University, Newark, New Jersey.

B.S. Biology, May 1976, Ramapo College, Mahwah, New Jersey.

PROFESSIONAL COURSES:

Delaware Valley College Herpetology Program, spring 1995.

NJ Association of Professional Soil Scientists Meeting. Stockton, NJ - October 1990.

Identification of Sedges and Rushes. Continuing Education, Cook College, Rutgers University - August 1990.

Wetlands Delineation. National Wetland Training Institute - July 1990.

The New Jersey Pinelands, Our Country's First National Reserve. Cook College, Rutgers University - March 1990.

Geology and Hydrogeology of New Jersey. Continuing Education, Cook College, Rutgers University - October 1989.

Understanding Soil Conditions of Wetlands. Continuing Education, Cook College, Rutgers University - April 1989.

The Permit Seminar. NJ Department of Environmental Protection and Rutgers University, Jamesburg, NJ - February 1989.

Planning for New Jersey's Freshwater Wetlands: Ecology and Regulations. Cook College, Rutgers University, - January 1989.

PROFESSIONAL EXPERIENCE: Mr. Smejkal has a strong background in Biology and Wetlands Ecology as well as over eight years experience in the bedrock geology and soils of the Northeastern United States. As Project Manager for Amy S. Greene Environmental Consultants, Inc., Mr. Smejkal is responsible for all aspects of wetlands investigations. These include: wetlands delineations, wildlife studies, hydrology and soils investigations, preparation of wetlands reports and environmental impact assessments, and interaction with governmental agencies.

Mr. Smejkal has been principally responsible for the performance of the following projects:

Environmental Impacts Evaluation of a 977 acre Superfund site within the New Jersey Pinelands. Included was a survey of Endangered and Threatened species such as timber rattlesnakes, Pine Barrens treefrog, pine snake, corn snake, bog turtles, and barred owl as well as evaluation of potential habitat.

Environmentally Sensitive Areas Assessment for developers in Montville Township, Morris County, NJ. Included was an analysis of wetlands and steep slopes and a wood turtle survey.

Wetlands delineation of a 300-acre parcel in Bridgewater Township, Somerset County, NJ. This project included extensive early spring searches for wood turtles to confirm reported sightings.

Wetland delineation and documentation of wood turtle occurrence on 83 acre site in Morris County.

Water quality sampling of three streams for 500 acre mixed development project in South Brunsick, Middlesex County.

Aquifer study in Hudson County including the Palisades diabase, Brunswick and Stockton formations and overlying sediments. Movement of contaminants in groundwater due to overpopulation was also addressed.

Wetland delineation of 450+ acre research/office complex in Monmouth County.

Wood turtle survey on 116 acre site of proposed residential development in Somerset County.

Preparation of a restoration plan including establishing previous wetland boundary, fill removal and replanting, and monitoring plan for the recovery and rehabilitation of a wetland in Morris County.

Preparation of a Statement of Compliance and application for a Waterfront Development Permit for an industrial complex in Woodbridge, Middlesex County.

Wetland delineation for proposed office and industrial park in Freehold Township, Monmouth County, NJ.

Wetland delineation and Letter of Interpretation application for proposed expansion of industrial building in Woodbridge Township, Middlesex County, NJ.

Hydrologic investigation of ground water drawdown and subsequent changes in vegetation in Marlboro Township, Monmouth County, NJ.

Wetland delineation and habitat evaluation for endangered and threatened species in Bergen and Monmouth County, NJ.

Environmental Impact Assessment in Randolph Township, Morris County, NJ. Wetlands delineation and endangered and threatened species assessment including documentation of wood turtle occurrence.
Colts Neck, Monmouth County, NJ. Wetland delineation and aquifer study for presentation to Township Environmental Council.

EMPLOYMENT HISTORY:

11/88-Present	Project Manager, Amy S. Greene Environmental Consultants, Inc.
2/87-11/88:	Geologist, Norman J. Coons, Inc., Consulting Engineers.
9/85-9/87:	Paleontological Research, Lamont-Doherty Geological Observatory of Columbia University.
AFFILIATIONS:	American Association for the Advancement of Science Geological Association of New Jersey Geological Society of America World Wildlife Fund Nature Conservancy